Final

Site Investigation Report
Former Range 42, Parcel 96Q;
Range, Choccolocco Corridor, Parcel 145Q-X; and
Impact Area, Choccolocco Corridor, Parcel 148Q-X

Fort McClellan
Calhoun County, Alabama

Prepared for:

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Task Order CK10
Contract No. DACA21-96-D-0018
Shaw Project No. 796887

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Revision 0

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, Shaw Environmental, Inc. conducted a site investigation (SI) at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X, at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical mission-related Army activities. The SI consisted of the collection and analysis of 15 surface and depositional soil samples, 14 subsurface soil samples, 2 surface water samples, 2 sediment samples, and 4 groundwater samples. In addition, 4 permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the site indicates that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), pesticides, and explosive compounds were detected in site media. Herbicides were not detected in site media. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values, and background screening values for Fort McClellan.

Constituents detected at concentrations exceeding SSSLs and background (where available) were identified as chemicals of potential concern (COPC) in site media. COPCs included five metals and one explosive compound in surface soil, four metals in subsurface soil, and manganese in groundwater. The most significant COPC was lead, which was detected at concentrations exceeding its residential SSSL in four surface soil samples and two subsurface soil samples. VOC, SVOC, and pesticide concentrations in site media were below SSSLs.

Constituents detected at concentrations exceeding ESVs and background (where available) were identified as constituents of potential ecological concern (COPEC) in surface soil, surface water, and sediment. COPECs included nine metals, seven pesticides, and one explosive compound in surface soil. Cobalt was the only COPEC identified in surface water. Sediment COPECs were barium, copper, manganese, and selenium.

Based on the results of the SI, past operations at Parcels 96Q, 145Q-X, and 148Q-X have impacted the environment. Therefore, Shaw Environmental, Inc. recommends that a remedial investigation be conducted to determine the extent of contamination in soil and groundwater at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X.

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) to perform the site investigation (SI) at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X, under Contract Number DACA21-96-D-0018, Task Order CK10.

This report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities conducted at Parcels 96Q, 145Q-X, and 148Q-X.

1.1 Project Description

Parcels 96Q, 145Q-X, and 148Q-X were identified as areas to be investigated prior to property transfer. The sites were classified as Category 1 Qualified parcels in the *Final Environmental Baseline Survey, Fort McClellan, Alabama* (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 1 Qualified parcels are areas that have no evidence of storage, release, or disposal of petroleum products or hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) but that do have other environmental or safety concerns. Parcels 96Q, 145Q-X, and 148Q-X were qualified because chemicals of potential concern (COPC) and/or unexploded ordnance (UXO) may be present as a result of historical range activities.

A site-specific work plan, comprised of a field sampling plan (SFSP), a safety and health plan, and a UXO safety plan, was finalized in April 2002 (IT, 2002a). The work plan was prepared to provide technical guidance for SI field activities at Parcels 96Q, 145Q-X, and 148Q-X. The site-specific work plan was used as an attachment to the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a; IT, 2002b). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect 14 surface soil samples, 1 depositional soil sample, 14 subsurface soil samples, 2 surface water samples, 2 sediment samples, and 4 groundwater samples to determine whether potential site-specific chemicals are present at the site.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at Parcels 96Q, 145Q-X, and 148Q-X at concentrations that pose an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by Shaw as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation, 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose "No Further Action" or to conduct additional work at the site.

1.3 Site Description and History

Parcels 96Q, 145Q-X, and 148Q-X are located in the Choccolocco Corridor approximately 1 mile east of the eastern boundary of the Main Post (Figure 1-1). Parcel 96Q was part of the Range 40 complex. Some FTMC personnel recalled the area being used during the Korean War era. The EBS concluded the following about Former Range 42, Parcel 96Q:

- Former Range 42 covers approximately 24 acres (the *Archives Search Report* [ASR] states the range was 6 acres) and was probably used during the 1960s and 1970s.

- Direction of fire was to the west.

The EBS concluded the following about Range, Choccolocco Corridor, Parcel 145Q-X:

- Parcel 145Q-X was identified by the Environmental Photographic Interpretation Center (EPIC) in northwestern Choccolocco Corridor (U.S. Environmental Protection Agency [EPA], 1990). This range appears to be active in EPIC aerial

LEGEND

- UNIMPROVED ROADS
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK

FIGURE 1-1
SITE LOCATION MAP
FORMER RANGE 42, PARCEL 96Q
RANGE, CHOCCOLOCCO CORRIDOR
PARCEL 145Q-X
IMPACT AREA, CHOCCOLOCCO
CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw™ Shaw Environmental, Inc.

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STARTING DATE: 02/06/03 | DRAWN BY: D. BOMAR
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photo composites dated 1949, 1954, and 1972 (1961 photo composite of Choccolocco Corridor was not included in the EPIC report).

- Parcel 145Q-X is approximately 44 acres. The southern boundary of Parcel 145Q-X partially overlaps Former Range 41, Parcel 95Q.

- Large-caliber weapons are presumed to have been fired at Parcel 145Q-X because cratered impact areas were identified within the range areas.

Parcel 148Q-X is an impact area that occupies approximately 5.8 acres within Parcels 96Q and 145Q-X (ESE, 1998).

Shaw personnel conducted a site visit in December 2001. The approximate locations of features observed during the site visit are shown on Figure 1-2. Several target bunkers used for pop-up targets were identified in the central portion of the range. Electrical system remnants and old target structures were noted at several locations. An electrical substation/building was identified near the northern boundary of Parcel 96Q. Offensive firing pits and the main firing line were identified along the eastern border of Parcel 96Q. The main firing line was built up approximately 10 feet higher than the surrounding area, and remnants of shooting boxes (approximately 2 feet wide by 3 feet long by 6 feet deep) were observed behind a bermed area. No typical small-arms range debris (e.g., casings or bullet fragments) was identified in the Parcel 96Q area. However, some expended flares, empty drums, and empty cylinders were found near a swampy area located in the eastern portion of Parcel 145Q-X, outside of the area of Parcel 96Q. A trench and area of shallow depressions were also found in this area.

Choccolocco Corridor is currently managed by the Alabama Forestry Commission. Recreation activities that may occur in the area include hiking, biking, horseback riding, and hunting.

1.3.1 Archives Search Report Ranges

Range Plates 6 and 10 from the ASR (USACE, 2001a) show OA-23, Range 42 (Small-Arms Range) in the area of Parcel 96Q (Figure 1-3). The ASR states the range was built during the Vietnam War era and was known as the "Squad Defense Range." The range was reportedly abandoned by 1974. A second ASR range (OA-22, Range 41 [Small-Arms Range]) is shown partially overlapping the southern portion of Parcel 145Q-X. This ASR range approximately matches the EBS Parcel 95Q boundaries.

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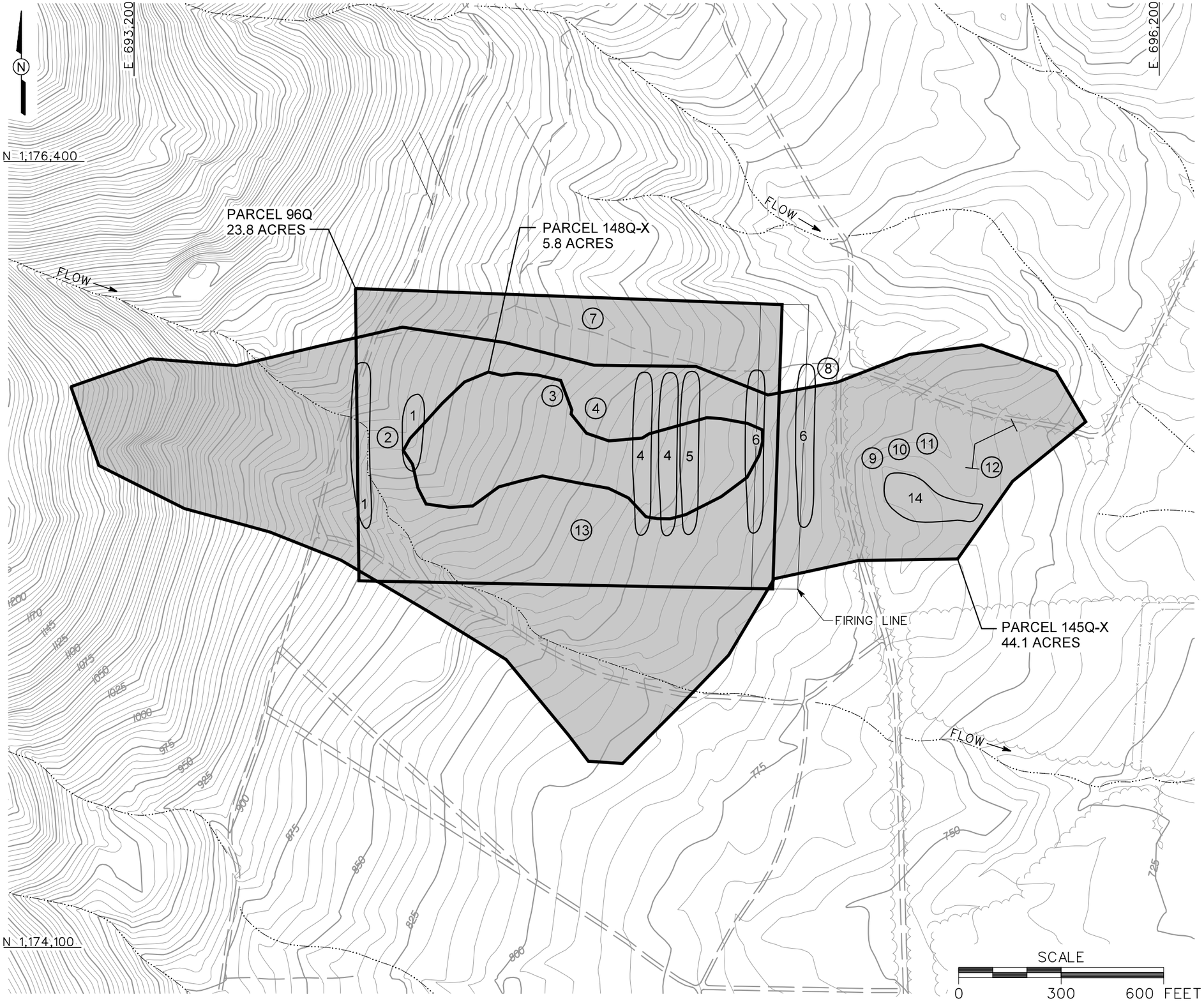

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- FENCE
- TRENCH

APPROXIMATE LOCATION OF OBSERVED FEATURES

1. POP-UP TARGET AREAS
2. OFFENSIVE FIRING POSITION
3. PIT
4. POP-UP TARGET AREAS/FIRING POINTS
5. POP-UP TARGET AREAS/FIRING POINTS WITH ELECTRICAL SERVICE REMNANTS
6. MAIN FIRING LINE WITH SHOOTING STATION REMNANTS
7. ELECTRICAL BUILDING REMNANTS
8. POSSIBLE OBSERVATION TOWER DESTROYED BY FIRE
9. EXPENDED FLARES
10. TWO 55-GALLON DRUMS
11. EMPTY CYLINDER
12. AREA OF SHALLOW DEPRESSIONS
13. LIGHT POLE, MOUNDS, AND DEPRESSIONS
14. SWAMPY AREA (EPHEMERAL)

SCALE
0 300 600 FEET

FIGURE 1-2
SITE MAP
FORMER RANGE 42, PARCEL 96Q
RANGE, CHOCCOLOCCO CORRIDOR
PARCEL 145Q-X
IMPACT AREA, CHOCCOLOCCO CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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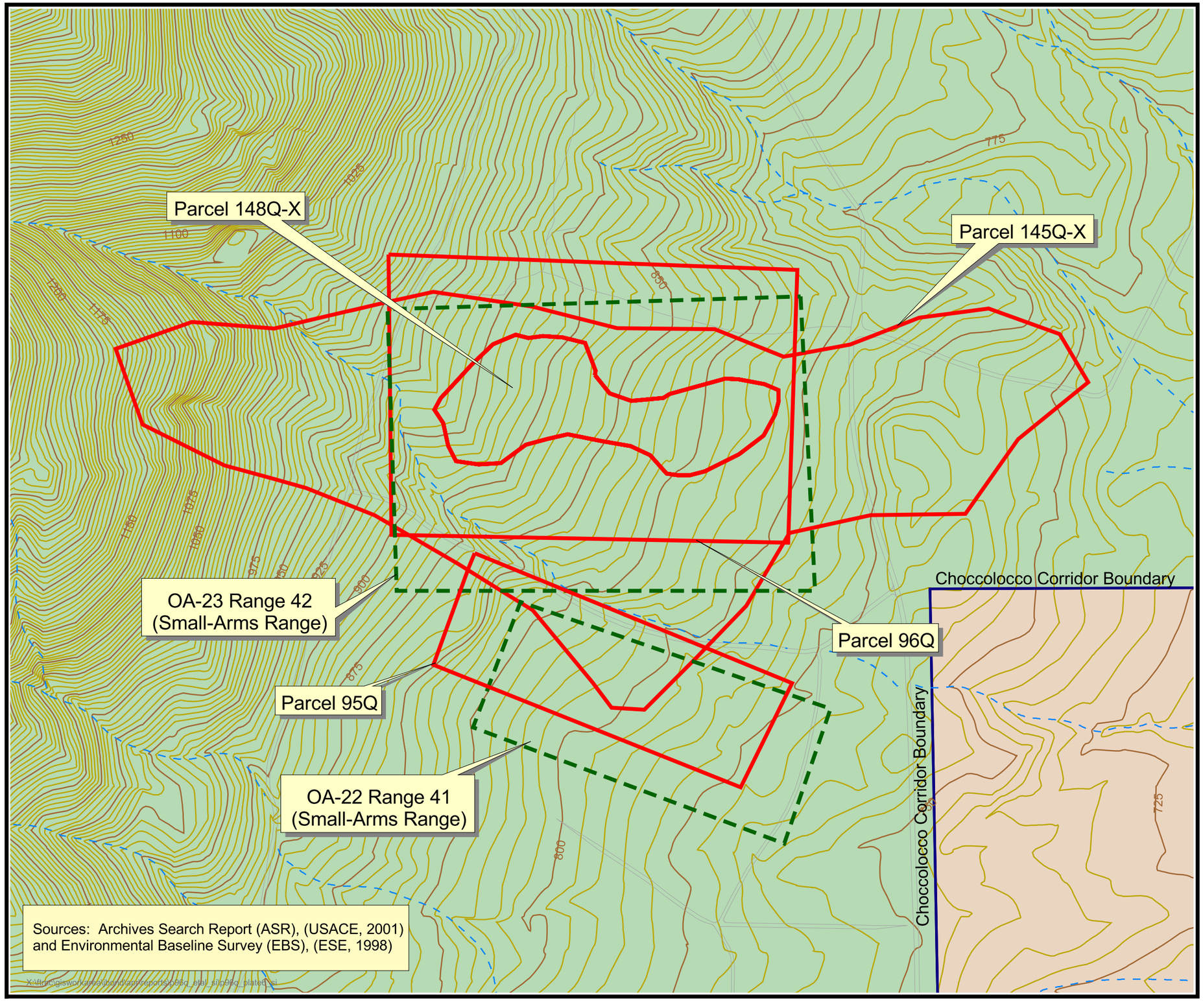

Figure 1-3

Range Location Map, ASR Plate 6

Parcels 96Q, 145Q-X, and 148Q-X
Fort McClellan, Alabama

Legend

- EBS Parcel
- ASR Range
- Roads
- Streams (dashed where intermittent)
- Topographic Contours 5-foot Interval

300 0 300 Feet

NAD83 State Plane Coordinates

N

Shaw Environmental, Inc.

U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

The aerial photographs in the ASR were reviewed to reveal any land use activity in the area of investigation. Photo Plate 4 (1954) and Photo Plate 5 (1961) show dirt roads in the area but do not indicate obvious usage. Photo Plate 6 (1969) clearly shows a developed and impacted area.

1.3.2 Aerial Photographs

Available aerial photographs from FTMC were reviewed to reveal any land-use activity at Parcels 96Q, 145Q-X, and 148Q-X. The following paragraphs summarize the review of aerial photographs for the years 1937, 1940, 1954, 1969, 1976, 1982, 1994, and 1998.

1937 and 1940. The 1937 and 1940 aerial photographs show the area is undeveloped and forested.

1954. The 1954 aerial photograph (Figure 1-4) shows the development of dirt roads, and some of the forest has been cleared. The ranges do not indicate obvious usage.

1969. The 1969 aerial photograph (Figure 1-5) shows the area under heavy use, with well-used roads. The impact area defined by Parcel 148Q-X shows probable evidence of berms and pits. The outer areas defined by Parcel 145Q-X (outside those areas defined by Parcel 96Q) are forested and show little use. No evidence is visible in this photograph to suggest the size of Parcel 145Q-X; the range area seems well defined by the boundary of Parcel 96Q. The clearing representing Parcel 95Q is evident in the southern tip of Parcel 145Q-X.

1976, 1982, 1994, and 1998. These photographs show an increase in ground vegetation and tree cover over time. In 1976, the site appears mostly overgrown with grass and brush. Trees and heavy brush have covered the site by 1982. The dirt roads are becoming less visible.

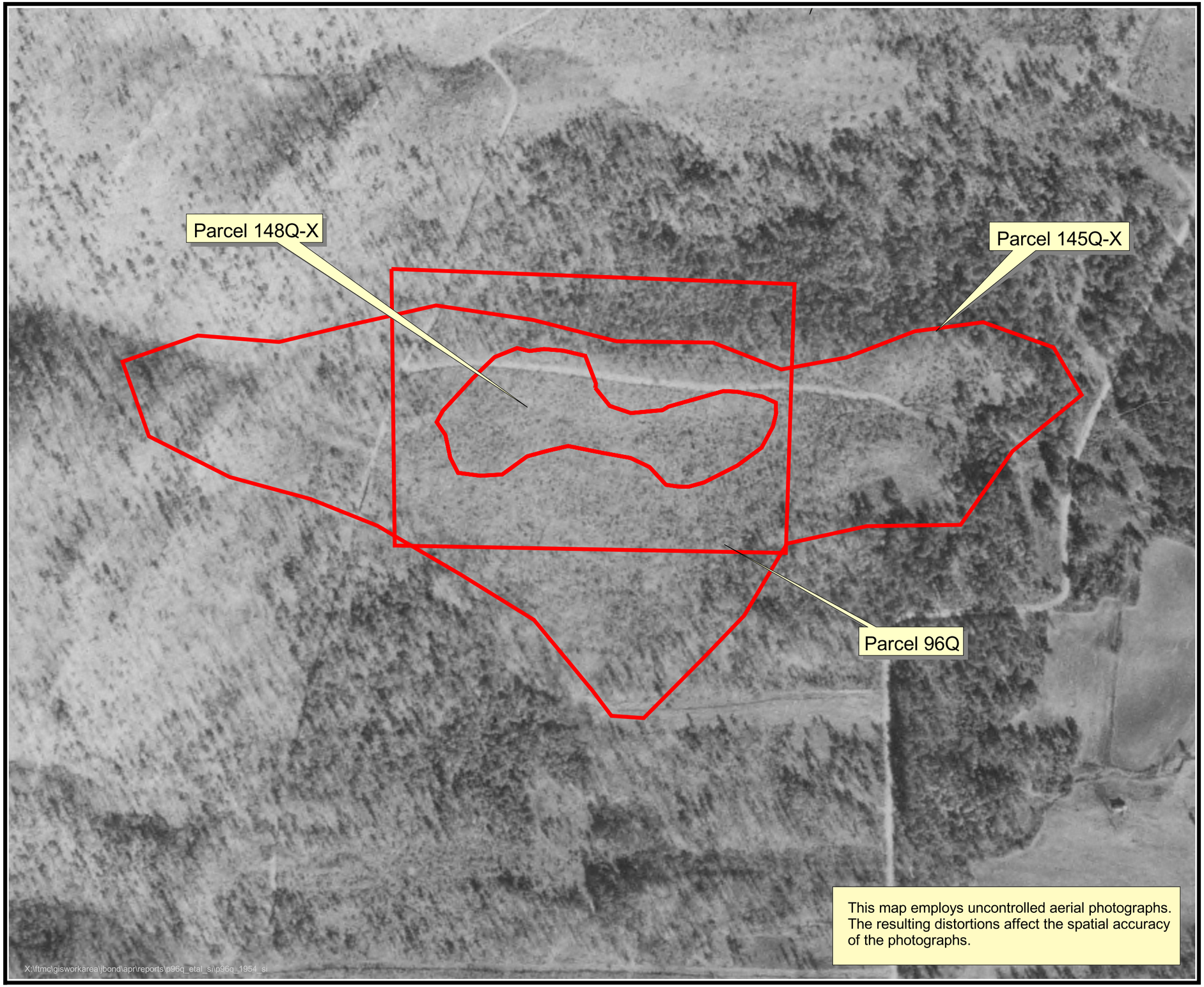

Figure 1-4

1954 Aerial Photograph

Parcels 96Q, 145Q-X, and 148Q-X, Fort McClellan, Alabama

Legend

Area of Investigation/ Parcel Boundary

300 0 300 Feet

NAD83 State Plane Coordinates

N

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U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

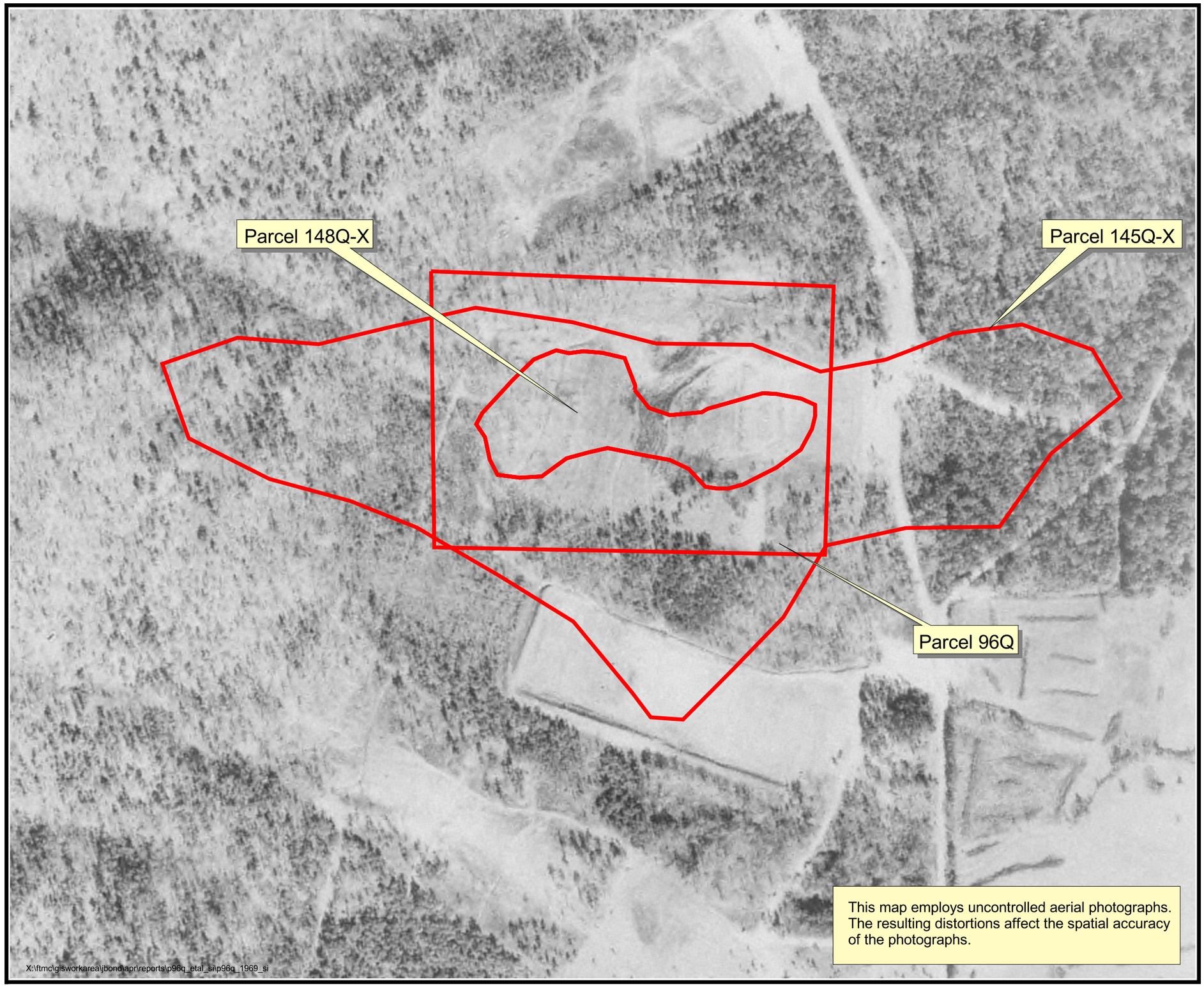

Figure 1-5

1969 Aerial Photograph

Parcels 96Q, 145Q-X,
and 148Q-X,
Fort McClellan, Alabama

Legend

Area of Investigation/
Parcel Boundary

300 0 300 Feet

NAD83 State Plane Coordinates

N

Shaw™ Shaw Environmental, Inc.

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of Engineers
Mobile District

Contract No. DACA21-96-D-0018

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The purpose of the study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas).

2. Areas where only release or disposal of petroleum products has occurred.

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response.

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken.

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.

7. Areas that are not evaluated or require additional evaluation.

For non-CERCLA environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number; the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified parcel; and the code of the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)
- RD = Radionuclides/radiological issues

- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with CERFA protocols (Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), EPA Region 4, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Parcels 96Q, 145Q-X, and 148Q-X are areas where no known or recorded storage, release, or disposal (including migration) of hazardous substances or petroleum products has occurred on site property. However, the parcels were qualified because COPCs and/or UXO may be present as a result of historical range activities. Therefore, these parcels required additional evaluation to determine their environmental condition.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by Shaw at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X, including UXO avoidance activities, environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 UXO Avoidance

UXO avoidance was performed at Parcels 96Q, 145Q-X, and 148Q-X following methodology outlined in the SAP. Shaw UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the area of investigation prior to site access. After the site was cleared for access, sample locations were monitored by UXO personnel following procedures outlined in the SAP.

3.2 Environmental Sampling

Environmental sampling performed during the SI at Parcels 96Q, 145Q-X, and 148Q-X included the collection of surface and depositional soil samples, subsurface soil samples, groundwater samples, surface water samples, and sediment samples for chemical analysis. Sample locations were determined by observing site physical characteristics during a site walk and by reviewing historical documents and aerial photographs pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.4.

3.2.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from 14 locations and a depositional soil sample was collected from 1 location at Parcels 96Q, 145Q-X, and 148Q-X, as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

Sample Collection. Surface soil samples were collected from the uppermost foot of soil using a stainless-steel hand auger, following the methodology specified in the SAP. The depositional soil sample was collected from the uppermost foot of soil with a stainless-steel spoon. Surface

Table 3-1

Sampling Locations and Rationale
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
HR-96Q-GP01	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the western portion of the parcel, near a target area identified during the site visit, to determine if potential site-specific chemicals have impacted site media.
HR-96Q-GP02	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the south-central portion of the parcel, near the clear cut area identified during the site visit, to determine if potential site-specific chemicals have impacted site media.
HR-96Q-GP03	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected adjacent to a pit in the north-central portion of Parcel 96Q to determine if potential site-specific chemicals have impacted site media.
HR-96Q-GP04	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the eastern portion of the parcel, along the main firing line as identified during the site visit, to determine if potential site-specific chemicals have impacted site media.
HR-96Q-MW01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected near the northeast corner of the parcel and near a probable drainage feature, to determine if potential site-specific chemicals have impacted site media.
HR-145Q-GP01	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the western portion of the parcel, upslope of Parcels 96Q and 148Q-X and along a drainage feature, to determine if potential site-specific chemicals have impacted site media.
HR-145Q-GP02	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the eastern portion of the parcel, in the vicinity of 55-gallon drums, expended flares, and an empty cylinder, to determine if potential site-specific chemicals have impacted site media.
HR-145Q-GP03	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected at the eastern end of the parcel, downslope of a trench and shallow depressions identified during the site visit, to determine if potential site-specific chemicals have impacted site media.
HR-145Q-MW01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected along a drainage feature in the southern portion of the parcel to determine if potential site-specific chemicals have impacted site media.
HR-145Q-MW02	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected in the eastern portion of the parcel, in the vicinity of the swampy area identified during the site visit, to determine if potential site-specific chemicals have impacted site media.
HR-145Q-DEP01	Depositional Soil	A depositional soil sample was collected from an ephemeral swampy area in the eastern portion of Parcel 145Q-X to determine if potential site-specific chemicals have impacted site media. The area was dry at the time of sample location.
HR-145Q-SW/SD02	Surface Water Sediment	Surface water and sediment samples were collected from an intermittent stream that flows southeast through the western portion of Parcel 145Q-X to determine if potential site-specific chemicals have impacted site media.
HR-131Q-SW/SD01	Surface Water Sediment	Surface water and sediment samples were collected from an intermittent stream that flows through the southern portion of Parcel 145Q-X to determine if potential site-specific chemicals have impacted site media. Sample location is downstream of the parcel.
HR-148Q-GP01	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the vicinity of target areas, pits, berms, etc. at the western end of Parcel 148Q-X to determine if potential site-specific chemicals have impacted site media.
HR-148Q-GP02	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the central area of Parcel 148Q-X to determine if potential site-specific chemicals have impacted site media.
HR-148Q-GP03	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected adjacent to target areas/firing points in the east-central portion of Parcel 148Q-X to determine if potential site-specific chemicals have impacted site media.
HR-148Q-MW01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected in the eastern portion of Parcel 148Q-X, in the impact area and downslope of most of the firing lines, bunkers, target pits, etc. identified during the site visit, to determine if potential site-specific chemicals have impacted site media.

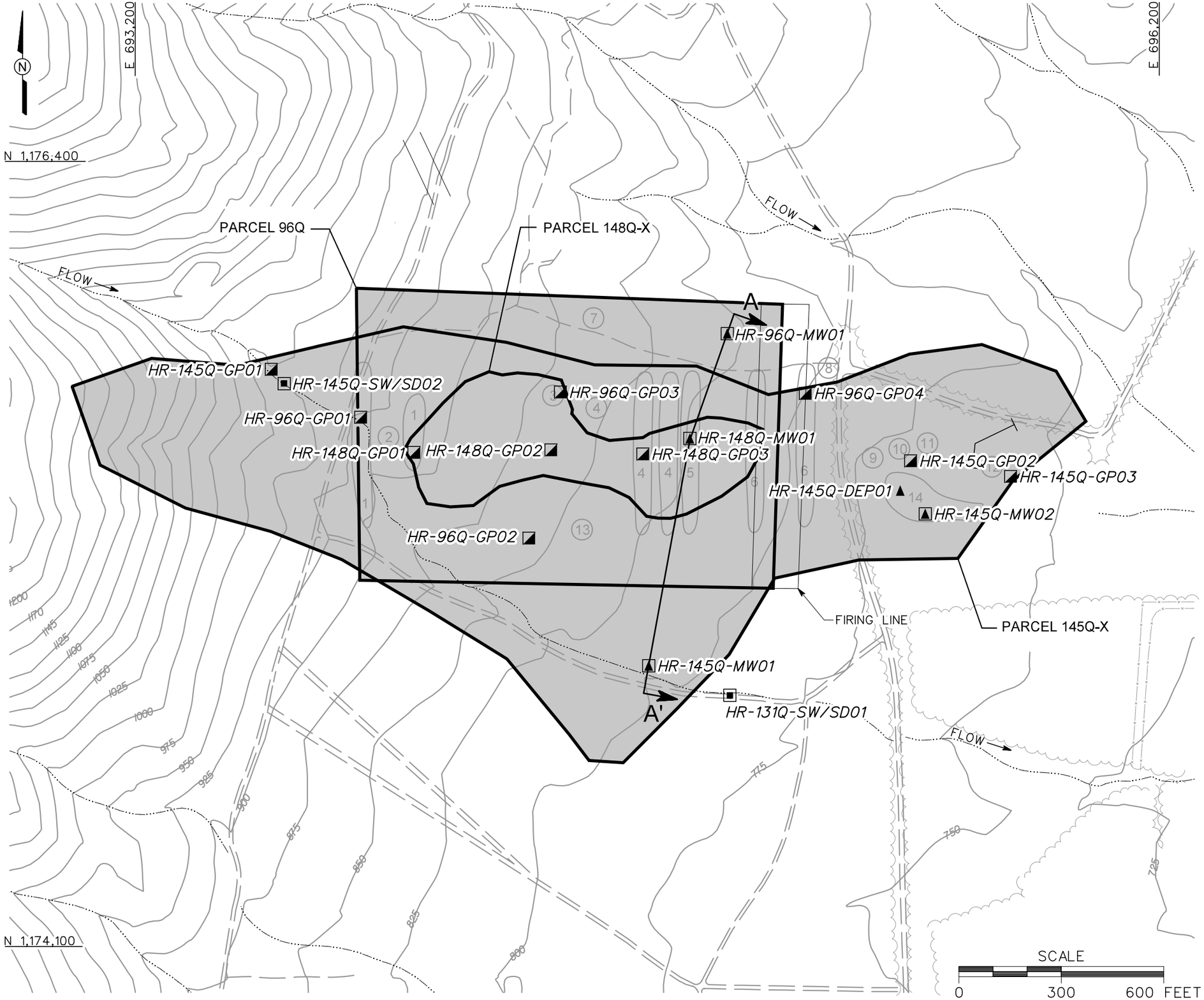
Table 3-2

Soil Sample Designations and Analytical Parameters
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-96Q-GP01	HR-96Q-GP01-SS-QP0001-REG	0-1			Metals and Explosives
	HR-96Q-GP01-DS-QP0002-REG	1-2			
HR-96Q-GP02	HR-96Q-GP02-SS-QP0003-REG	0-1			Metals and Explosives
	HR-96Q-GP02-DS-QP0004-REG	1.5-2.5	HR-96Q-GP02-DS-QP0005-FD		
HR-96Q-GP03	HR-96Q-GP03-SS-QP0006-REG	0-1			Metals and Explosives
	HR-96Q-GP03-DS-QP0007-REG	1-2			
HR-96Q-GP04	HR-96Q-GP04-SS-QP0008-REG	0-1			Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
	HR-96Q-GP04-DS-QP0009-REG	1-2		HR-96Q-GP04-DS-QP0009-MS/MSD	
HR-96Q-MW01	HR-96Q-MW01-SS-QP0010-REG	0-1			Metals and Explosives
	HR-96Q-MW01-DS-QP0011-REG	1-2			
HR-145Q-GP01	HR-145Q-GP01-SS-QR0001-REG	0-1			Metals and Explosives
	HR-145Q-GP01-DS-QR0002-REG	1-2			
HR-145Q-GP02	HR-145Q-GP02-SS-QR0003-REG	0-1			Metals and Explosives
	HR-145Q-GP02-DS-QR0004-REG	1-2			
HR-145Q-GP03	HR-145Q-GP03-SS-QR0005-REG	0-1			Metals and Explosives
	HR-145Q-GP03-DS-QR0006-REG	2-3			
HR-145Q-MW01	HR-145Q-MW01-SS-QR0007-REG	0-1			Metals and Explosives
	HR-145Q-MW01-DS-QR0008-REG	2-3	HR-145Q-MW01-DS-QR0009-FD		
HR-145Q-MW02	HR-145Q-MW02-SS-QR0010-REG	0-1			Metals and Explosives
	HR-145Q-MW02-DS-QR0011-REG	3-4			
HR-145Q-DEP01	HR-145Q-DEP01-DEP-QR0012-REG	0-1	HR-145Q-DEP01-DEP-QR0013-FD		Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
HR-148Q-GP01	HR-148Q-GP01-SS-QS0001-REG	0-1			Metals and Explosives
	HR-148Q-GP01-DS-QS0002-REG	1-2			
HR-148Q-GP02	HR-148Q-GP02-SS-QS0003-REG	0-1		HR-148Q-GP02-SS-QS0003-MS/MSD	Metals and Explosives
	HR-148Q-GP02-DS-QS0004-REG	2-3			
HR-148Q-GP03	HR-148Q-GP03-SS-QS0005-REG	0-1			Metals and Explosives
	HR-148Q-GP03-DS-QS0006-REG	1-2	HR-148Q-GP03-DS-QS0007-FD		
HR-148Q-MW01	HR-148Q-MW01-SS-QS0008-REG	0-1			Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
	HR-148Q-MW01-DS-QS0009-REG	1-2			

FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

DWG. NO.: ...\796887es.653 | PROJ. NO.: 796887
INITIATOR: T. WINTON | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: S. MORAN
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 02/06/03 | DRAWN BY: D. BOMAR
2/24/2004 2:44:42 PM
lstout
c:\cadd\Design\796887es.653



LEGEND

- UNIMPROVED ROADS
- PAVED ROADS
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- FENCE
- TRENCH
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- MONITORING WELL / GROUNDWATER, SURFACE, AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION
- A A' CROSS SECTION LOCATION

APPROXIMATE LOCATION OF OBSERVED FEATURES

1. POP-UP TARGET AREAS
2. OFFENSIVE FIRING POSITION
3. PIT
4. POP-UP TARGET AREAS/FIRING POINTS
5. POP-UP TARGET AREAS/FIRING POINTS WITH ELECTRICAL SERVICE REMNANTS
6. MAIN FIRING LINE WITH SHOOTING STATION REMNANTS
7. ELECTRICAL BUILDING REMNANTS
8. POSSIBLE OBSERVATION TOWER DESTROYED BY FIRE
9. EXPENDED FLARES
10. TWO 55-GALLON DRUMS
11. EMPTY CYLINDER
12. AREA OF SHALLOW DEPRESSIONS
13. LIGHT POLE, MOUNDS, AND DEPRESSIONS
14. SWAMPY AREA (EPHEMERAL)

SCALE
0 300 600 FEET

FIGURE 3-1
SAMPLE LOCATION MAP
FORMER RANGE 42, PARCEL 96Q
RANGE, CHOCCOLOCCO CORRIDOR
PARCEL 145Q-X
IMPACT AREA, CHOCCOLOCCO CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw™ Shaw Environmental, Inc.

and depositional soil samples were collected by first removing surface debris (e.g., rocks and vegetation) from the immediate sample area. The soil sample was then collected with the sampling device and was screened with a photoionization detector (PID) in accordance with procedures outlined in the SAP. As necessary, the soil fraction for volatile organic compound (VOC) analysis was collected directly from the sample device using three EnCore® samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from 14 soil borings at Parcels 96Q, 145Q-X, and 148Q-X, as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than one foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using a stainless-steel hand auger, following procedures specified in the SAP. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

Subsurface soil samples were collected continuously to 4 feet bgs or until hand-auger refusal was encountered. Samples were field screened using a PID to measure volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were below background, the deepest sample interval was submitted for analysis. As necessary, the soil fraction for VOC analysis was collected directly from the sample device using three EnCore samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The on-site geologist constructed a detailed boring log for each soil boring. The boring logs are included in Appendix B.

3.2.3 Monitoring Well Installation

Four permanent monitoring wells were installed at Parcels 96Q, 145Q-X, and 148Q-X to collect groundwater samples for laboratory analysis. The well locations are shown on Figure 3-1.

Table 3-3 summarizes construction details of the monitoring wells installed at the site. The well construction logs are included in Appendix B.

Shaw contracted Miller Drilling Company to install the permanent wells using a hollow-stem auger rig at four of the hand-auger soil boring locations (HR-96Q-MW01, HR-145Q-MW01, HR-145Q-MW02, and HR-148Q-MW01). The wells were installed following procedures outlined in the SAP. The borehole at each well location was advanced with a 4¼-inch inside diameter (ID) hollow-stem auger from ground surface to the first groundwater-bearing zone in residuum at the well location. Beginning at the completion depth of the hand-auger boring, a 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. The samples were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geological and hydrogeological information. Soil characteristics were described using the "Burmeister Identification System" described in Hunt (1986) and the Unified Soil Classification System as outlined in American Society for Testing and Materials (ASTM) Method D 2488 (ASTM, 2000). The boring logs are included in Appendix B.

Upon reaching the target depth in each borehole, a 10- to 20-foot length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 polyvinyl chloride (PVC) screen with a PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A filter pack consisting of Number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 5 feet above the top of the well screen as the augers were removed. A bentonite seal, consisting of approximately 5 feet of bentonite pellets, was placed immediately on top of the filter pack and hydrated with potable water. The bentonite seal placement and hydration followed procedures in the SAP. Bentonite-cement grout was tremied into the remaining annular space of the well from the top of the bentonite seal to ground surface. A well cap was placed on the PVC well riser. A locking protective steel casing was placed over the PVC well riser, and a concrete pad was constructed around the wellhead.

The monitoring wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in the SAP. The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well to re-establish the natural hydraulic flow conditions. Development continued for 8 hours or until the well was

Table 3-3

Monitoring Well Construction Summary
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Well Location	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
HR-96Q-MW01	1175890.35	694938.66	834.96	837.07	45	15	29.7 - 44.7	2" ID Sch. 40 PVC
HR-145Q-MW01	1174917.09	694708.57	812.44	814.49	46	20	25.7 - 45.7	2" ID Sch. 40 PVC
HR-145Q-MW02	1175362.13	695518.74	761.98	764.11	25	10	14.7 - 24.7	2" ID Sch. 40 PVC
HR-148Q-MW01	1175583.03	694829.35	828.88	830.94	30	10	19.7 - 29.7	2" ID Sch. 40 PVC

Permanent wells installed using hollow-stem auger.

Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983.
Elevations referenced to the North American Vertical Datum of 1988.

2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
amsl - Above mean sea level.
bgs - Below ground surface.
ft - Feet

pumped dry and allowed to recharge three successive times. The well development logs are included in Appendix C.

3.2.4 Water Level Measurements

The depth to groundwater was measured in the permanent wells at the site and in wells at adjacent parcels on October 18, 2002, following procedures outlined in the SAP. Depth to groundwater was measured with an electronic water-level meter. The meter probe and cable were cleaned before use at each well following decontamination methodology presented in the SAP. Measurements were referenced to the top of the PVC well casing, as summarized in Table 3-4.

3.2.5 Groundwater Sampling

A groundwater sample was collected from each of the four monitoring wells installed at Parcels 96Q, 145Q-X, and 148Q-X. The well/groundwater sample locations are shown on Figure 3-1. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and analytical parameters are listed in Table 3-5.

Sample Collection. The groundwater samples were collected using either a peristaltic pump or a bladder pump equipped with Teflon™ tubing, following the procedures outlined in the SAP. Samples for VOC analysis (from monitoring well HR-148Q-MW01) were collected using the "tube evacuation" method described in the SAP (IT, 2002b). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Field parameters were measured using a calibrated water-quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.4.

3.2.6 Surface Water Sampling

Two surface water samples were collected at the site at the locations shown on Figure 3-1. The surface water sample locations and rationale are listed in Table 3-1. The sample designations and analytical parameters are listed in Table 3-7. The actual sampling locations were determined based on field observations.

Sample Collection. The surface water sample was collected by dipping a stainless-steel pitcher in the water and pouring the water into the sample containers, following procedures in the SAP. The sample was collected after field parameters had been measured using a calibrated

Table 3-4

Groundwater Elevations
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X and Vicinity
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Groundwater Elevation (ft amsl)
HR-96Q-MW01	18-Oct-02	29.73	837.07	834.96	807.34
HR-145Q-MW01	18-Oct-02	21.70	814.49	812.44	792.79
HR-145Q-MW02	18-Oct-02	10.96	764.11	761.98	753.15
HR-148Q-MW01	18-Oct-02	24.70	830.94	828.88	806.24
Wells at Adjacent Parcels					
HR-94Q-MW01	18-Oct-02	23.48	904.66	904.73	881.18
HR-94Q-MW02	18-Oct-02	16.37	793.11	791.11	776.74
HR-95Q-MW01	18-Oct-02	29.45	840.20	838.16	810.75
HR-95Q-MW02	18-Oct-02	14.49	815.27	813.20	800.78
HR-95Q-MW03	18-Oct-02	19.91	785.74	783.86	765.83
HR-131Q-MW01	18-Oct-02	53.62	770.92	768.90	717.30
HR-143Q-MW01	18-Oct-02	35.69	827.98	825.98	792.29
HR-143Q-MW02	18-Oct-02	28.02	827.22	825.14	799.20
HR-144Q-MW01	18-Oct-02	NA	903.99	901.94	NA
HR-146Q-MW01	18-Oct-02	11.49	826.46	826.20	814.97
HR-146Q-MW02	18-Oct-02	23.69	828.17	825.86	804.48
HR-147Q-MW01	18-Oct-02	67.25	842.95	840.87	775.70
HR-147Q-MW02	18-Oct-02	29.36	804.02	801.93	774.66

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

amsl - Above mean sea level
BTOC - Below top of casing
ft - Feet
NA - Not available; well was dry.

Table 3-5

Groundwater Sample Designations and Analytical Parameters
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples		Analytical Parameters
		Field Duplicates	MS/MSD	
HR-96Q-MW01	HR-96Q-MW01-GW-QP3001-REG			Metals and Explosives
HR-145Q-MW01	HR-145Q-MW01-GW-QR3001-REG	HR-145Q-MW01-GW-QR3002-FD	HR-145Q-MW01-GW-QR3001-MS/MSD	Metals and Explosives
HR-145Q-MW02	HR-145Q-MW02-GW-QR3003-REG			Metals and Explosives
HR-148Q-MW01	HR-148Q-MW01-GW-QS3001-REG			Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives

FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

Table 3-6

Groundwater and Surface Water Field Parameters
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Sample Medium	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
HR-96Q-MW01	15-Aug-02	GW	0.022	6.41	320	20.3	101	4.85
HR-131Q-SW/SD01	18-Jul-02	SW	0.021	8.39	137	24.8	0.4	5.96
HR-145Q-MW01	13-Aug-02	GW	0.023	4.25	212	23.9	18	4.65
HR-145Q-MW02	12-Aug-02	GW	0.040	3.76	293	19.6	53	5.05
HR-145Q-SW/SD02	6-Sep-02	SW	0.045	7.33	310	21.9	0	5.28
HR-148Q-MW01	14-Aug-02	GW	0.030	8.48	288	21.9	6.4	4.89

°C - Degrees Celsius.
GW - Groundwater.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.
SW - Surface water.

Table 3-7

Surface Water and Sediment Sample Designations and Analytical Parameters
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	QA/QC Samples[a]		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-145Q-SW/SD02	HR-145Q-SW/SD02-SW-QR2003R-REG	SW			Metals, Explosives, TOC[b], and Grain Size[b]
	HR-145Q-SW/SD02-SD-QR1002R-REG	SD			
HR-131Q-SW/SD01	HR-131Q-SW/SD01-SW-QY2001-REG	SW			
	HR-131Q-SW/SD01-SD-QY1001-REG	SD			

[a] No QA/QC samples specified in site-specific field sampling plan.

[b] Sediment sample only.

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SD - Sediment.
SW - Surface water.
TOC - Total organic carbon.

water quality meter. Surface water field parameters are summarized in Table 3-6. The sample collection log is included in Appendix A. The sample was analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.2.7 Sediment Sampling

Two sediment samples were collected at the same locations as the surface water samples, as shown on Figure 3-1. The sediment sample locations and rationale are presented in Table 3-1. The sample designations and analytical parameters are listed in Table 3-7. The actual sediment sample locations were determined based on field observations.

Sample Collection. The sediment samples were collected in accordance with procedures specified in the SAP. Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. The samples were then homogenized and placed in the appropriate sample containers. The sample collection logs are included in Appendix A. The sediment samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.3 Surveying of Sample Locations

Sample locations were surveyed using global positioning system and conventional civil survey techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Samples collected at Parcels 96Q, 145Q-X, and 148Q-X were analyzed for the following parameters using EPA SW-846 methods, including Update III methods where applicable:

- Target analyte list metals – EPA Methods 6010B/7470A/7471A
- Nitroaromatic/nitramine explosives – EPA Method 8330.

A minimum of ten percent of the samples were analyzed for the following additional parameters:

- Target compound list (TCL) VOCs – EPA Method 8260B
- TCL semivolatile organic compounds (SVOC) – EPA Method 8270C
- Chlorinated herbicides – EPA Method 8151A

- Chlorinated pesticides – EPA Method 8081A
- Organophosphorous pesticides – EPA Method 8141A.

In addition, the sediment samples were analyzed for total organic carbon (TOC) content (Walkley-Black method) and grain size (ASTM Method D-422).

3.5 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in the SAP. Sample documentation and chain-of-custody records were completed as specified in the SAP.

Completed analysis request and chain-of-custody records (Appendix A) were included with each shipment of sample coolers to EMAX Laboratories, Inc. in Torrance, California.

3.6 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in the SAP. The IDW generated during the SI at Parcels 96Q, 145Q-X, and 148Q-X was segregated as follows:

- Drill cuttings
- Purge water from well development, sampling activities, and decontamination fluids
- Spent well materials and personal protective equipment.

Solid IDW was staged on site in lined roll-off bins prior to waste characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, drill cuttings, spent well materials, and personal protective equipment generated during the SI were disposed as nonhazardous waste at the Three Corners Landfill located in Piedmont, Alabama.

Liquid IDW was staged on site pending the results of waste characterization. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonhazardous waste to the FTMC wastewater treatment plant on the Main Post.

3.7 Variances/Nonconformances

Two variances to the SFSP were recorded during completion of the SI at Parcels 96Q, 145Q-X, and 148Q-X. The variances did not alter the intent of the investigation or the sampling rationale presented in the SFSP. The variances are summarized in Table 3-8 and the variance reports are included in Appendix E.

No nonconformances to the SFSP were recorded during completion of the SI at Parcels 96Q, 145Q-X, and 148Q-X.

3.8 Data Quality

The field sample analytical data are presented in tabular form in Appendix F. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan, the FTMC SAP and quality assurance plan, and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 2001b) and the stipulated requirements for the generation of definitive data presented in the SAP. Chemical data were reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms.

Data Validation. The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. The data validation results are summarized by parcel in quality assurance reports, which include the data validation summary reports (Appendix G). Selected results were qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the Shaw Environmental Management System database for tracking and reporting. The qualified data were used in comparisons to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparisons to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

Table 3-8

Variances to the Site-Specific Field Sampling Plan
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Site Investigation
Surface water and sediment samples were not collected at proposed location HR-145Q-SW/SD01 in a swampy area at Parcel 145Q-X. Instead, a depositional soil sample was collected at this location.	Surface water and sediment samples were not collected because surface water was not present in the swampy area at the time of sample collection.	None. Data from the depositional soil sample were used to characterize the site.
Sample location HR-145Q-SW/SD02 was moved approximately 1,700 feet upstream and northwest of its proposed location in the SFSP.	The SFSP inadvertently proposed sample locations HR-131Q-SW/SD01 and HR-145Q-SW/SD02 at the same location.	None. Relocating the sample ensured that the sampling objective in the SFSP was met.

SFSP - Site-specific field sampling plan.

4.0 Site Characterization

Subsurface investigations performed at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X, provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County it is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge

and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite. Weaver Cave, located approximately one mile west of the northwest boundary of the Main Post, is situated in gray dolomite and limestone mapped as the Rome Formation (Osborne et al., 1997). The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded

dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Osborne et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert towards the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the

northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale based on fossil data.

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty clay, shale, and mudstone with interbedded light to medium gray, very fine to fine grained, argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds of medium to dark gray, argillaceous, bioclastic to cherty limestone and beds of clayey coal up to a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is generally found within a structurally complex area known as the Coosa deformed belt. In the deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because their lithologic similarity and significant deformation make it impractical to map the contact (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation and Floyd Shale are found throughout the western quarter of Pelham Range.

The Jacksonville thrust fault is the most significant structural geological feature in the vicinity of the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997). Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

The Pell City fault serves as a fault contact between the bedrock within the FTMC window and the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed approximately nine miles west of the FTMC window on Pelham Range, where it traverses northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell

City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham Range is located within the Coosa deformed belt. The Pell City thrust sheet is a large-scale thrust sheet containing Cambrian and Ordovician rocks and is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 5 to 20 miles wide and approximately 90 miles in length) consisting mainly of thin imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

4.1.2 Site Geology

Soils at Parcels 96Q, 145Q-X, and 148Q-X fall mainly into four mapping units: Anniston and Allen gravelly loam, Anniston and Allen stony loam, Jefferson gravelly fine sandy loam, and Stony Rough Land sandstone (U.S. Department of Agriculture [USDA], 1961).

The Anniston and Allen Series of soils consists of strongly acidic, deep, well-drained soils that have developed in old local alluvium. The parent material washed from the adjacent higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. Sandstone and quartzite gravel and cobbles, measuring as much as 8 inches in diameter, are common on the surface and throughout the soil. For this soil series, the depth to bedrock is typically from 2 feet to greater than 10 feet, with depth to water greater than 20 feet (USDA, 1961). The stony loam series differs from the gravelly loams in having less erosion, a thicker surface layer, and more stones.

The Jefferson series consists of well-drained, strongly acid soils that occur in small areas on fans and foot slopes in the Choccolocco Mountains. These soils have developed from old local alluvium that washed or sloughed from ridges of sandstone, shale, and quartzite. The surface soil is dark grayish brown sandy loam, and the subsoil is yellowish brown, light fine sandy clay. Fragments of sandstone and quartzite are found throughout the profile (USDA, 1961).

The Stony Rough Land sandstone consists of rough, mountainous areas with many outcrops of

sandstone and quartzite bedrock, loose rock fragments, and scattered patches of sandy soil material. Slopes are generally more than 25 percent. The soil material is generally shallow over bedrock. Runoff is high, infiltration is slow, and the capacity for available moisture is low (USDA, 1961).

The eastern and central portions of Parcels 96Q, 145Q-X, and 148Q-X consist of the Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded (AcB2) and 6 to 10 percent slopes, eroded (AcC2) (USDA, 1961). The eastern end of the range (near the main firing line) consists of Anniston and Allen stony loams, 0 to 10 percent slopes, eroded (AdC). These series consist of friable soils that have developed in old alluvium on foot slopes and fans along the bases of the mountains. Some severely eroded areas may be common on the surface for this soil type, as well as a few shallow gullies. Generally, the depth to bedrock ranges from 2 feet to greater than 10 feet. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium, limestone, or shale bedrock. The depth to the water table is likely greater than 20 feet. The stony loam series differs from the gravelly loams in having less erosion, a thicker surface layer, and more stones.

The southeastern corner of Parcel 96Q and Parcel 145Q-X consists of the Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded (JeB2) and 6 to 10 percent slopes, eroded (JeC2) (USDA, 1961). These soils are located along the intermittent stream/drainage gully and its fan near the southeastern boundary of Parcel 96Q and southern portion of Parcel 145Q-X.

The western end of Parcel 96Q consists of Anniston and Allen stony loams, 10 to 25 percent slopes, eroded (AdE). These soils have strong slopes and numerous stones. This small area is between the steep mountains to the west and the more gentle slopes to the east. The western end of Parcel 145Q-X that extends past the boundary of Parcel 96Q consists of the Stony Rough Land sandstone (Ss).

Bedrock beneath the site is mapped as undifferentiated Cambrian Chilhowee Group in the extreme western portion, Shady Dolomite in the western-central portion, and Rome Formation in the rest of the area of investigation (Osborne et al., 1997). The undifferentiated Chilhowee Group consists of a basal unit of arkosic conglomerate and mudstone overlain by a unit of greenish gray mudstone with minor siltstone and sandstone. The sequences grades upward into a white to moderate reddish orange friable sandstone and conglomerate containing interbedded gray silty mudstone (Raymond et al., 1988). The Chilhowee Group is overlain by the Shady

Dolomite. The Shady Dolomite is typically bluish gray, thick-bedded, medium crystalline limestone and light to dark gray, argillaceous to sandy, massive to laminated dolomite with a local unit of silty clay and clayey siltstone at the base (Raymond et al., 1988). The Shady Dolomite is overlain by the Rome Formation. The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite (Raymond et al., 1988).

A geologic cross section was constructed from the hollow-stem auger boring data, as shown on Figure 4-1. The geologic cross section location is shown on Figure 3-1. The residuum encountered during drilling activities at Parcels 96Q, 145Q-X, and 148Q-X consisted of light brown to yellow-orange clay with some fine to coarse sand, little subangular sandstone and quartzite gravel, and trace silt. Bedrock was not encountered during drilling activities at Parcels 96Q, 145Q-X, and 148Q-X.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water feature in the Choccolocco Corridor is Choccolocco Creek, which flows south through the Corridor. Choccolocco Creek and its tributaries drain all of Choccolocco Corridor and empty into the Coosa River.

Ground elevation within the area of investigation at Parcels 96Q, 145Q-X, and 148Q-X ranges from approximately 750 to 1,170 feet above mean sea level. Surface water runoff in the area of investigation drains into intermittent streams that flow to the east-southeast. A swampy area was observed in the eastern area of Parcel 145Q-X during the SI site walk in December 2001. However, the area was subsequently dry during sample collection activities in September 2002, indicating that this area does not remain perennially wet.

4.2.2 Hydrogeology

Static groundwater levels were measured in monitoring wells at Parcels 96Q, 145Q-X, and 148Q-X and in wells at adjacent parcels on October 18, 2003, as summarized in Table 3-4. Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater flow map constructed using the October 18,

LEGEND

- SCREEN INTERVAL
- WATER TABLE (OCTOBER 18, 2002)
- 807.34 GROUNDWATER ELEVATION (FT MSL)
- CONTACT DASHED WHERE INFERRED
- CLAY, SOME SAND, LITTLE GRAVEL
- CLAY AND SILT, SOME SAND
- GRAVEL AND CLAY
- SAND AND CLAY, SOME SILT, LITTLE GRAVEL
- GRAVEL, SILT AND SAND
- SAND, SOME SILT

NOTES:

1. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
2. DASHED WHERE INFERRED.
3. SEE FIGURE 3-1 FOR CROSS SECTION LOCATION.

HORIZONTAL
0 120 240 FEET

VERTICAL
0 10 20 FEET

FIGURE 4-1
GEOLOGIC CROSS SECTION A-A'
FORMER RANGE 42, PARCEL 96Q
RANGE, CHOCCOLOCCO CORRIDOR
PARCEL 145Q-X
IMPACT AREA, CHOCCOLOCCO
CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

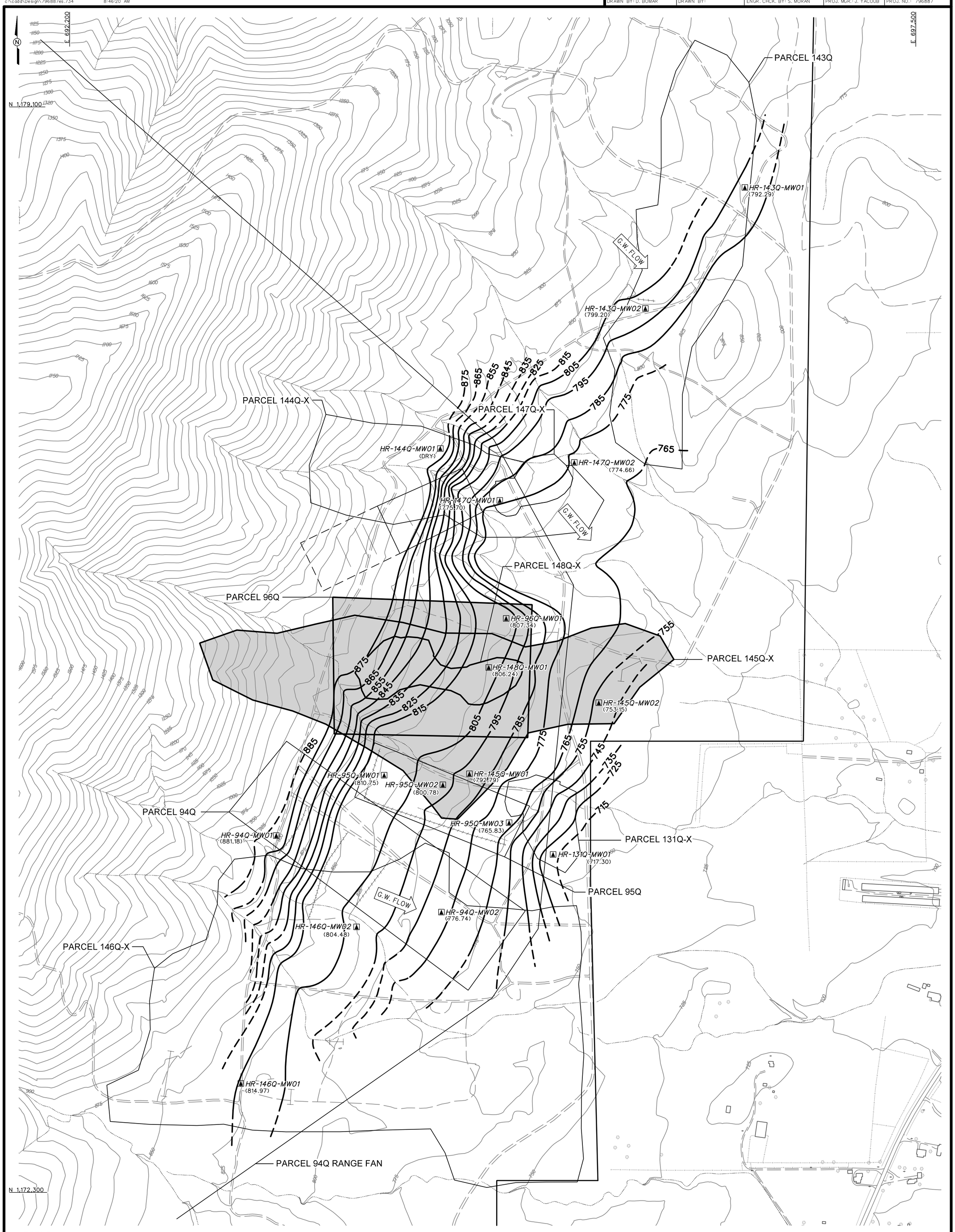
Shaw Environmental, Inc.

DWG. NO.: ...\796887es687 | PROJ. NO.: 796887
INITIATOR: C. LEVAAS | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: S. MORAN
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 02/27/03 | DRAWN BY: D. BOMAR
2/25/2004 8:41:15 AM
lstout
c:\cadd\Design\796887es687

2002, data is shown on Figure 4-2. Based on the water level data, groundwater elevations correspond with topography and flow direction appears to be to the east-southeast in the vicinity of Parcels 96Q, 145Q-X, and 148Q-X.

lstout 2/25/2004
c:\cadd\Design\796887es.734 8:46:20 AM

STARTING DATE: 04/23/03	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: C. LEVAAS	DWG. NO.\796887es.734
DRAWN BY: D. BOMAR	DRAWN BY:	ENGR. CHCK. BY: S. MORAN	PROJ. MGR.: J. YACOUB	PROJ. NO.: 796887



LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- (755.71) GROUNDWATER ELEVATION (FT MSL) (OCTOBER 18, 2002)
- G.W. FLOW GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- PARCEL BOUNDARY
- INVESTIGATED BOUNDARY
- SURFACE DRAINAGE / CREEK
- TRENCH
- BERM
- FENCE
- MONITORING WELL / GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

SCALE
0 300 600 FEET

FIGURE 4-2
GROUNDWATER ELEVATION MAP
CHOCCOLOCCO RANGES,
CHOCCOLOCCO CORRIDOR

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw™ Shaw Environmental, Inc.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X, indicate that metals, VOCs, SVOCs, pesticides, and explosives were detected in site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by Shaw for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (Science Applications International Corporation, 1998).

The following sections and Tables 5-1 through 5-5 summarize the results of the comparison of detected constituent concentrations to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix F.

5.1 Surface and Depositional Soil Analytical Results

Fourteen surface soil samples and one depositional soil sample were collected for chemical analysis at Parcels 96Q, 145Q-X, and 148Q-X. Surface and depositional soil samples were collected from the uppermost foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

Metals. A total of 20 metals were detected in the surface and depositional soil samples. The concentrations of eight metals (aluminum, antimony, arsenic, chromium, copper, iron, lead, and manganese) exceeded their respective SSSLs in one or more samples. Of these, aluminum, antimony, copper, lead, and manganese also exceeded their respective background values, as follows:

- Aluminum (17,900 to 32,000 milligrams per kilogram [mg/kg]) exceeded its SSSL (7,803 mg/kg) and background (16,306 mg/kg) at seven sample locations.

Table 5-1

Surface and Depositional Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-145Q-DEP01					HR-145Q-GP01					HR-145Q-GP02					HR-145Q-GP03				
Sample Number					QR0012					QR0001					QR0003					QR0005				
Sample Date					3-Sep-02					22-Jul-02					22-Jul-02					22-Jul-02				
Sample Depth (Feet)					0- 1					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	3.20E+04		YES	YES	YES	7.29E+03				YES	1.98E+04		YES	YES	YES	2.12E+04		YES	YES	YES
Antimony	mg/kg	1.99E+00	3.11E+00	3.50E+00	ND					ND					ND					ND				
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.81E+00			YES		2.32E+00			YES		8.70E+00			YES		5.35E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.76E+02		YES		YES	2.50E+02		YES		YES	8.37E+01					6.81E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	8.47E-01	J	YES			6.13E-01	J				8.18E-01	J	YES			4.68E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.70E+02					1.26E+03					1.69E+02					2.71E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.12E+01				YES	4.63E+00				YES	1.83E+01				YES	1.59E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	3.34E+00	J				5.42E+00					1.20E+01					3.59E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	2.83E+01		YES			9.63E+00					9.80E+00					2.29E+01		YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.54E+04			YES	YES	6.78E+03			YES	YES	3.34E+04			YES	YES	1.89E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.57E+02		YES		YES	8.49E+01		YES		YES	2.35E+01					1.14E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.09E+03		YES			5.41E+02					6.14E+02					8.33E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	4.88E+01					1.15E+03			YES	YES	5.52E+02			YES	YES	1.49E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	1.95E-01		YES		YES	9.67E-02	J	YES			8.32E-02	J	YES			7.97E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.02E+01					5.26E+00					6.50E+00					7.33E+00				
Potassium	mg/kg	8.00E+02	NA	NA	1.20E+03		YES			9.93E+02		YES			4.41E+02	J				1.39E+03		YES		
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	2.09E+00		YES		YES	9.69E-01	J	YES		YES	2.53E+00		YES		YES	1.20E+00		YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	4.84E+01	J				2.56E+01	J				ND					2.95E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	3.68E+01				YES	8.19E+00				YES	2.67E+01				YES	2.50E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	3.54E+01					1.63E+01					2.78E+01					2.44E+01				
VOLATILE ORGANIC COMPOUNDS																								
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	3.30E-02	J				NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	4.30E-01	J				NR					NR					NR				
SEMIVOLATILE ORGANIC COMPOUNDS																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	ND					NR					NR					NR				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					NR					NR					NR				
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	2.00E+01	ND					NR					NR					NR				
PESTICIDES																								
4,4'-DDT	mg/kg		1.79E+00	2.50E-03	2.00E-02				YES	NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	ND					NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	1.90E-02				YES	NR					NR					NR				
Heptachlor	mg/kg	NA	1.40E-01	1.00E-01	1.30E-03	J				NR					NR					NR				
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	ND					NR					NR					NR				
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	8.70E-03	J			YES	NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	ND					NR					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	5.50E-03	J			YES	NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	1.90E-03	J				NR					NR					NR				
gamma-BHC (Lindane)	mg/kg	NA	4.85E-01	5.00E-05	1.00E-03	J			YES	NR					NR					NR				
EXPLOSIVES																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	ND					ND					ND					ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-145Q-MW01					HR-145Q-MW02					HR-148Q-GP01					HR-148Q-GP02				
Sample Number					QR0007					QR0010					QS0001					QS0003				
Sample Date					23-Jul-02					22-Jul-02					23-Jul-02					23-Jul-02				
Sample Depth (Feet)					0- 1					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.27E+04			YES	YES	1.79E+04		YES	YES	YES	1.43E+04			YES	YES	2.63E+04		YES	YES	YES
Antimony	mg/kg	1.99E+00	3.11E+00	3.50E+00	ND					ND					5.03E+01	J	YES	YES	YES	ND				
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.62E+00			YES		3.57E+00			YES		1.14E+01			YES	YES	5.91E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.22E+02					1.12E+02					1.69E+02		YES		YES	9.54E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	6.68E-01	J				9.14E-01	J	YES			8.06E-01	J	YES			4.41E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.99E+02					1.93E+02					7.14E+02					2.82E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.05E+01				YES	1.17E+01				YES	8.88E+00				YES	2.33E+01			YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	6.36E+00					1.40E+01					6.37E+00					3.78E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	6.73E+00					1.37E+01		YES			3.51E+02		YES	YES	YES	6.50E+01		YES		YES
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.17E+04			YES	YES	1.12E+04			YES	YES	1.06E+04			YES	YES	2.16E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.70E+01					3.48E+01					4.64E+03	J	YES	YES	YES	2.74E+02	J	YES		YES
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.81E+02					5.92E+02					7.08E+02					6.12E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.22E+03			YES	YES	1.87E+03		YES	YES	YES	1.02E+03			YES	YES	4.88E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.35E-02	J				6.10E-02	J				6.54E-02	J				1.30E-01		YES		YES
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	6.04E+00					6.99E+00					5.73E+00					6.19E+00				
Potassium	mg/kg	8.00E+02	NA	NA	6.08E+02					6.37E+02					6.71E+02					5.10E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	7.52E-01	J	YES			1.07E+00	J	YES		YES	1.35E+00		YES		YES	1.48E+00		YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	ND					2.53E+01	J				4.33E+01	B				4.43E+01	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.57E+01				YES	2.25E+01				YES	1.54E+01				YES	3.60E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.52E+01					4.40E+01		YES			7.42E+01		YES		YES	3.06E+01				
VOLATILE ORGANIC COMPOUNDS																								
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					NR					NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR					NR				
SEMIVOLATILE ORGANIC COMPOUNDS																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	NR					NR					NR					NR				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	NR					NR					NR					NR				
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	2.00E+01	NR					NR					NR					NR				
PESTICIDES																								
4,4'-DDT	mg/kg		1.79E+00	2.50E-03	NR					NR					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					NR					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					NR					NR					NR				
Heptachlor	mg/kg	NA	1.40E-01	1.00E-01	NR					NR					NR					NR				
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					NR					NR					NR				
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					NR					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					NR					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					NR					NR					NR				
gamma-BHC (Lindane)	mg/kg	NA	4.85E-01	5.00E-05	NR					NR					NR					NR				
EXPLOSIVES																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	ND					ND					ND					ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-148Q-GP03					HR-148Q-MW01					HR-96Q-GP01					HR-96Q-GP02				
Sample Number					QS0005					QS0008					QP0001					QP0003				
Sample Date					23-Jul-02					22-Jul-02					22-Jul-02					22-Jul-02				
Sample Depth (Feet)					0- 1					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.51E+04			YES	YES	2.60E+04		YES	YES	YES	8.81E+03			YES	YES	1.29E+04			YES	YES
Antimony	mg/kg	1.99E+00	3.11E+00	3.50E+00	8.61E+00	J	YES	YES	YES	5.41E+00	J	YES	YES	YES	ND					ND				
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.56E+00			YES		5.46E+00			YES		3.08E+00	J		YES		3.85E+00	J		YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.16E+02					5.36E+01					1.32E+02		YES			1.27E+02		YES		
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	5.91E-01	J				ND					5.83E-01	J				8.52E-01	J	YES		
Calcium	mg/kg	1.72E+03	NA	NA	4.73E+02					4.59E+02					4.81E+02					3.97E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.37E+01				YES	2.27E+01				YES	6.06E+00				YES	1.02E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	7.36E+00					3.40E+00					5.72E+00					8.30E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	2.20E+02		YES		YES	1.51E+02		YES		YES	8.36E+01		YES		YES	1.05E+01				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.16E+04			YES	YES	2.76E+04			YES	YES	8.74E+03			YES	YES	1.45E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.62E+03	J	YES	YES	YES	1.01E+03	J	YES	YES	YES	9.01E+02		YES	YES	YES	4.73E+01		YES		
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	6.19E+02					6.08E+02					3.94E+02					5.30E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.23E+03			YES	YES	2.34E+02				YES	9.42E+02			YES	YES	1.28E+03			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	5.91E-02	J				1.56E-01		YES		YES	4.30E-02	J				3.89E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	6.08E+00					5.24E+00					4.56E+00					6.65E+00				
Potassium	mg/kg	8.00E+02	NA	NA	6.19E+02					8.40E+02		YES			3.49E+02	B				5.95E+02	B			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.17E+00		YES		YES	1.45E+00		YES		YES	1.01E+00	B	YES		YES	1.36E+00	B	YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	4.04E+01	B				4.73E+01	B				2.12E+01	J				2.56E+01	J			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.75E+01				YES	3.61E+01				YES	9.59E+00				YES	1.70E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	5.38E+01		YES		YES	3.90E+01					2.67E+01	J				1.95E+01	J			
VOLATILE ORGANIC COMPOUNDS																								
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					7.10E-03	J				NR					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					9.40E-02	J				NR					NR				
SEMIVOLATILE ORGANIC COMPOUNDS																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	NR					ND					NR					NR				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	NR					ND					NR					NR				
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	2.00E+01	NR					ND					NR					NR				
PESTICIDES																								
4,4'-DDT	mg/kg		1.79E+00	2.50E-03	NR					ND					NR					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					ND					NR					NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					ND					NR					NR				
Heptachlor	mg/kg	NA	1.40E-01	1.00E-01	NR					ND					NR					NR				
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					2.30E-02	J			YES	NR					NR				
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					ND					NR					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					ND					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					ND					NR					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					ND					NR					NR				
gamma-BHC (Lindane)	mg/kg	NA	4.85E-01	5.00E-05	NR					ND					NR					NR				
EXPLOSIVES																								
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	ND					ND					ND					ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-96Q-GP03					HR-96Q-GP04					HR-96Q-MW01				
Sample Number					QP0006					QP0008					QP0010				
Sample Date					22-Jul-02					22-Jul-02					22-Jul-02				
Sample Depth (Feet)					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	2.13E+04		YES	YES	YES	1.37E+04			YES	YES	1.07E+04			YES	YES
Antimony	mg/kg	1.99E+00	3.11E+00	3.50E+00	ND					5.54E+00	J	YES	YES	YES	ND				
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.53E+00	J		YES		4.00E+00	J		YES		2.21E+00	J		YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	7.88E+01					5.73E+01					3.56E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	5.41E+02					1.90E+04		YES			1.11E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.89E+01				YES	1.50E+01				YES	1.43E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.40E+00					1.34E+00	J				1.24E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.15E+01					3.83E+02		YES	YES	YES	1.07E+01				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.70E+04			YES	YES	1.63E+04			YES	YES	9.03E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	4.55E+01		YES			6.44E+01		YES		YES	1.42E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.77E+02					1.16E+04		YES			2.65E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.34E+02				YES	1.17E+02				YES	6.40E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	7.40E-02	J				7.81E-02	J				4.60E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.32E+00					3.76E+00					2.83E+00				
Potassium	mg/kg	8.00E+02	NA	NA	4.91E+02	B				4.29E+02	B				2.68E+02	B			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.36E+00	B	YES		YES	8.07E-01	B	YES			1.00E+00	B	YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	2.78E+01	J				2.88E+01	J				ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.97E+01				YES	2.35E+01				YES	1.69E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.16E+01	J				5.64E+01	J	YES		YES	1.29E+01	J			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	NR					ND					NR				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					4.40E-02	J				NR				
SEMIVOLATILE ORGANIC COMPOUNDS																			
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	NR					5.30E-01					NR				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	NR					6.40E-01					NR				
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	2.00E+01	NR					3.50E+00					NR				
PESTICIDES																			
4,4'-DDT	mg/kg		1.79E+00	2.50E-03	NR					ND					NR				
Dieldrin	mg/kg	NA	3.88E-02	5.00E-04	NR					3.40E-03	J			YES	NR				
Endrin	mg/kg	NA	2.32E+00	1.00E-03	NR					1.50E-03	J			YES	NR				
Heptachlor	mg/kg	NA	1.40E-01	1.00E-01	NR					ND					NR				
Methoxychlor	mg/kg	NA	3.89E+01	1.99E-02	NR					ND					NR				
alpha-BHC	mg/kg	NA	1.00E-01	2.50E-03	NR					ND					NR				
alpha-Chlordane	mg/kg	NA	1.69E+00	1.00E-01	NR					4.20E-04	J				NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					ND					NR				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	NR					ND					NR				
gamma-BHC (Lindane)	mg/kg	NA	4.85E-01	5.00E-05	NR					ND					NR				
EXPLOSIVES																			
2,4-Dinitrotoluene	mg/kg	NA	9.27E-01	1.28E+00	ND					1.50E+00			YES	YES	ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.
J - Compound was positively identified; reported value is an estimated concentration.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
NR - Not requested.
Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location				HR-145Q-GP01				HR-145Q-GP02				HR-145Q-GP03				HR-145Q-MW01			
Sample Number				QR0002				QR0004				QR0006				QR0008			
Sample Date				22-Jul-02				22-Jul-02				22-Jul-02				23-Jul-02			
Sample Depth (Feet)				1 - 2				1 - 2				2 - 3				2 - 3			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	7.48E+03				2.49E+04		YES	YES	2.51E+04		YES	YES	1.70E+04		YES	YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	2.06E+00			YES	1.29E+01			YES	4.67E+00			YES	5.33E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	1.52E+02				7.33E+01				6.62E+01				9.04E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	5.36E-01	J			7.81E-01	J			4.32E-01	J			5.06E-01	J		
Calcium	mg/kg	6.37E+02	NA	5.88E+02				1.14E+02	J			1.32E+02				1.33E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	5.20E+00				2.57E+01			YES	1.58E+01				1.46E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	4.69E+00				9.05E+00				3.05E+00				4.52E+00			
Copper	mg/kg	1.94E+01	3.13E+02	5.43E+00				1.19E+01				1.04E+01				8.54E+00			
Iron	mg/kg	4.48E+04	2.34E+03	6.59E+03			YES	6.08E+04		YES	YES	1.78E+04			YES	2.13E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	3.94E+01		YES		1.87E+01				9.45E+00				1.11E+01			
Magnesium	mg/kg	7.66E+02	NA	4.77E+02				6.73E+02				9.84E+02		YES		7.48E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	6.71E+02			YES	2.64E+02				9.01E+01				2.98E+02			
Mercury	mg/kg	7.00E-02	2.33E+00	8.23E-02	J	YES		7.39E-02	J	YES		8.31E-02	J	YES		5.55E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	4.26E+00				6.23E+00				7.96E+00				7.67E+00			
Potassium	mg/kg	7.11E+02	NA	1.04E+03		YES		6.24E+02				9.34E+02		YES		1.30E+03		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	8.10E-01	J	YES		3.75E+00		YES		1.34E+00		YES		1.37E+00		YES	
Sodium	mg/kg	7.02E+02	NA	ND				2.59E+01	J			2.40E+01	J			2.36E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				1.00E+00	J		YES	ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	7.97E+00				3.89E+01				2.61E+01				2.40E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.23E+01				3.09E+01				2.61E+01				1.68E+01			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	NR				NR				NR				NR			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
SEMIVOLATILE ORGANIC COMPOUNDS																			
Fluoranthene	mg/kg	NA	3.09E+02	NR				NR				NR				NR			
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	NR				NR				NR				NR			

Table 5-2

Subsurface Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location				HR-145Q-MW02				HR-148Q-GP01				HR-148Q-GP02				HR-148Q-GP03			
Sample Number				QR0011				QS0002				QS0004				QS0006			
Sample Date				22-Jul-02				23-Jul-02				23-Jul-02				23-Jul-02			
Sample Depth (Feet)				3 - 4				1 - 2				2 - 3				1 - 2			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.69E+04		YES	YES	1.47E+04		YES	YES	2.40E+04		YES	YES	1.49E+04		YES	YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				5.08E+00	J	YES	YES	ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	1.47E+00			YES	3.64E+00			YES	4.99E+00			YES	4.31E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.85E+01				1.41E+02				1.04E+02				1.49E+02			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				7.17E-01	J			5.48E-01	J			6.20E-01	J		
Calcium	mg/kg	6.37E+02	NA	7.31E+01	J			2.71E+02				1.77E+02				6.03E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	1.46E+01				1.03E+01				1.82E+01				1.22E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.62E+00	J			6.09E+00				6.51E+00				6.56E+00			
Copper	mg/kg	1.94E+01	3.13E+02	8.23E+00				5.95E+01		YES		1.67E+01				7.86E+01		YES	
Iron	mg/kg	4.48E+04	2.34E+03	5.74E+03			YES	1.16E+04			YES	1.73E+04			YES	1.10E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	9.69E+00				1.28E+03	J	YES	YES	5.64E+01	J	YES		4.68E+02	J	YES	YES
Magnesium	mg/kg	7.66E+02	NA	4.79E+02				7.09E+02				7.60E+02				6.15E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	6.30E+01				8.41E+02			YES	5.27E+02			YES	1.23E+03			YES
Mercury	mg/kg	7.00E-02	2.33E+00	5.16E-02	J			4.57E-02	J			9.29E-02	J	YES		5.30E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	4.16E+00				6.35E+00				7.70E+00				5.82E+00			
Potassium	mg/kg	7.11E+02	NA	5.70E+02				6.63E+02				6.33E+02				5.65E+02			
Selenium	mg/kg	4.70E-01	3.91E+01	ND				1.35E+00		YES		1.30E+00		YES		1.20E+00		YES	
Sodium	mg/kg	7.02E+02	NA	ND				4.91E+01	B			5.18E+01	B			5.05E+01	B		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.21E+01				1.61E+01				3.04E+01				1.71E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.60E+01				2.72E+01				2.32E+01				3.36E+01			
VOLATILE ORGANIC COMPOUNDS																			
2-Butanone	mg/kg	NA	4.66E+03	NR				NR				NR				NR			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
SEMIVOLATILE ORGANIC COMPOUNDS																			
Fluoranthene	mg/kg	NA	3.09E+02	NR				NR				NR				NR			
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	NR				NR				NR				NR			

Table 5-2

Subsurface Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location				HR-148Q-MW01				HR-96Q-GP01				HR-96Q-GP02			
Sample Number				QS0009				QP0002				QP0004			
Sample Date				22-Jul-02				22-Jul-02				22-Jul-02			
Sample Depth (Feet)				1 - 2				1 - 2				1.5 - 2.5			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	1.81E+04		YES	YES	9.31E+03			YES	1.32E+04			YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	4.17E+00			YES	2.81E+00	J		YES	3.40E+00	J		YES
Barium	mg/kg	2.34E+02	5.47E+02	8.84E+01				1.21E+02				8.61E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	4.10E-01	J			5.15E-01	J			5.30E-01	J		
Calcium	mg/kg	6.37E+02	NA	3.08E+02				2.95E+02				1.74E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	2.23E+01				7.81E+00				9.57E+00			
Cobalt	mg/kg	1.75E+01	4.68E+02	6.57E+00				5.89E+00				5.43E+00			
Copper	mg/kg	1.94E+01	3.13E+02	5.49E+01		YES		3.87E+01		YES		7.89E+00			
Iron	mg/kg	4.48E+04	2.34E+03	1.65E+04			YES	8.94E+03			YES	1.25E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	3.29E+02	J	YES		2.77E+02		YES		2.15E+01			
Magnesium	mg/kg	7.66E+02	NA	6.28E+02				4.44E+02				5.54E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	4.33E+02			YES	6.34E+02			YES	5.97E+02			YES
Mercury	mg/kg	7.00E-02	2.33E+00	6.89E-02	J			3.94E-02	J			3.92E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	5.98E+00				5.73E+00				5.36E+00			
Potassium	mg/kg	7.11E+02	NA	5.62E+02	J			4.05E+02	B			6.87E+02			
Selenium	mg/kg	4.70E-01	3.91E+01	9.96E-01	J	YES		1.05E+00	B	YES		9.63E-01	B	YES	
Sodium	mg/kg	7.02E+02	NA	4.32E+01	B			2.36E+01	J			3.07E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.46E+01				1.09E+01				1.74E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.82E+01				1.96E+01	J			1.64E+01	J		
VOLATILE ORGANIC COMPOUNDS															
2-Butanone	mg/kg	NA	4.66E+03	8.10E-03	J			NR				NR			
Acetone	mg/kg	NA	7.76E+02	1.00E-01	J			NR				NR			
SEMIVOLATILE ORGANIC COMPOUNDS															
Fluoranthene	mg/kg	NA	3.09E+02	ND				NR				NR			
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	ND				NR				NR			

Table 5-2

Subsurface Soil Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location				HR-96Q-GP03				HR-96Q-GP04				HR-96Q-MW01			
Sample Number				QP0007				QP0009				QP0011			
Sample Date				22-Jul-02				22-Jul-02				22-Jul-02			
Sample Depth (Feet)				1 - 2				1 - 2				1 - 2			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	2.92E+04		YES	YES	1.90E+04		YES	YES	3.32E+04		YES	YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	5.95E+00	J		YES	5.33E+00	J		YES	4.80E+00	J		YES
Barium	mg/kg	2.34E+02	5.47E+02	8.63E+01				3.89E+01				4.35E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	3.70E+02				7.82E+02		YES		1.30E+02			
Chromium	mg/kg	3.83E+01	2.32E+01	2.50E+01			YES	2.13E+01				3.34E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	2.49E+00				2.02E+00	J			1.83E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	9.29E+00				1.90E+01				8.47E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.35E+04			YES	2.88E+04			YES	2.60E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.18E+01				1.04E+01				1.08E+01			
Magnesium	mg/kg	7.66E+02	NA	7.59E+02				8.19E+02		YES		5.42E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	7.56E+01				6.76E+01				4.54E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	1.11E-01	J	YES		1.18E-01		YES		2.26E-01		YES	
Nickel	mg/kg	1.29E+01	1.54E+02	7.05E+00				3.97E+00				6.44E+00			
Potassium	mg/kg	7.11E+02	NA	5.97E+02	B			6.13E+02	B			5.73E+02	B		
Selenium	mg/kg	4.70E-01	3.91E+01	1.42E+00	B	YES		1.97E+00	J	YES		1.72E+00	B	YES	
Sodium	mg/kg	7.02E+02	NA	3.16E+01	J			2.50E+01	J			2.53E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	4.11E+01				3.48E+01				4.96E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.13E+01	J			1.47E+01	J			1.94E+01	J		
VOLATILE ORGANIC COMPOUNDS															
2-Butanone	mg/kg	NA	4.66E+03	NR				ND				NR			
Acetone	mg/kg	NA	7.76E+02	NR				4.00E-02	J			NR			
SEMIVOLATILE ORGANIC COMPOUNDS															
Fluoranthene	mg/kg	NA	3.09E+02	NR				7.20E-02	J			NR			
N-Nitrosodiphenylamine	mg/kg	NA	1.29E+02	NR				1.60E-01	J			NR			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama* , July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location				HR-145Q-MW01				HR-145Q-MW02				HR-148Q-MW01				HR-96Q-MW01			
Sample Number				QR3001				QR3003				QS3001				QP3001			
Sample Date				14-Aug-02				12-Aug-02				14-Aug-02				15-Aug-02			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/L	2.34E+00	1.56E+00	1.66E-01	B			2.36E-01	B			ND				2.87E-01			
Barium	mg/L	1.27E-01	1.10E-01	1.55E-02				3.11E-02				1.30E-02				1.27E-02			
Calcium	mg/L	5.65E+01	NA	8.79E-01	J			3.50E+00				2.34E+00				1.93E+00			
Cobalt	mg/L	2.34E-02	9.39E-02	1.86E-02	J			2.04E-02				ND				2.29E-02			
Iron	mg/L	7.04E+00	4.69E-01	2.22E-01	J			6.75E-01	J		YES	3.09E-02	J			5.20E-01	J		YES
Lead	mg/L	8.00E-03	1.50E-02	ND				ND				1.38E-03	J			ND			
Magnesium	mg/L	2.13E+01	NA	5.53E-01	J			1.23E+00				9.27E-01	J			7.60E-01	J		
Manganese	mg/L	5.81E-01	7.35E-02	1.17E-01			YES	1.69E+00		YES	YES	6.54E-02	J			2.37E-01			YES
Potassium	mg/L	7.20E+00	NA	2.27E+00	J			1.62E+00	B			1.37E+00	J			2.35E+00	B		
Sodium	mg/L	1.48E+01	NA	8.31E-01	J			9.30E-01	J			7.62E-01	J			1.40E+00			
VOLATILE ORGANIC COMPOUNDS																			
Methylene chloride	mg/L	NA	7.85E-03	NR				NR				4.30E-04	B			NR			
EXPLOSIVES																			
1,3,5-Trinitrobenzene	mg/L	NA	4.69E-02	ND				ND				3.20E-04	J			ND			
2,4,6-Trinitrotoluene	mg/L	NA	2.23E-03	ND				ND				ND				6.80E-04	J		

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-4

Surface Water Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-131Q-SW/SD01					HR-145Q-SW/SD02				
Sample Number					QY2001					QR2003R				
Sample Date					18-Jul-02					6-Sep-02				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	VQ	>BKG	>SSSL	>ESV	Result	VQ	>BKG	>SSSL	>ESV
METALS														
Aluminum	mg/L	5.26E+00	1.53E+01	8.70E-02	1.62E-01	J			YES	3.38E-01				YES
Barium	mg/L	7.54E-02	1.10E+00	3.90E-03	2.27E-02				YES	3.46E-02				YES
Calcium	mg/L	2.52E+01	NA	1.16E+02	9.13E-01	J				3.78E-01	J			
Cobalt	mg/L	NA	9.31E-01	3.00E-03	1.83E-02	J			YES	ND				
Copper	mg/L	1.27E-02	6.23E-01	6.54E-03	6.28E-03	J				ND				
Iron	mg/L	1.96E+01	4.70E+00	1.00E+00	3.32E-01	J				5.37E-01	J			
Lead	mg/L	8.67E-03	1.50E-02	1.32E-03	ND					2.35E-03	J			YES
Magnesium	mg/L	1.10E+01	NA	8.20E+01	3.04E-01	J				4.12E-01	J			
Manganese	mg/L	5.65E-01	6.40E-01	8.00E-02	9.78E-03	J				5.89E-02	J			
Potassium	mg/L	2.56E+00	NA	5.30E+01	1.32E+00	J				2.62E+00	J	YES		
Sodium	mg/L	3.44E+00	NA	6.80E+02	1.16E+00					1.08E+00				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

VQ - Data validation qualifier.

Table 5-5

Sediment Analytical Results
Former Range 42, Parcel 96Q; Range, Parcel 145Q-X; and Impact Area, Parcel 148Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location					HR-131Q-SW/SD01					HR-145Q-SW/SD02				
Sample Number					QY1001					QR1002R				
Sample Date					18-Jul-02					6-Sep-02				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	VQ	>BKG	>SSSL	>ESV	Result	VQ	>BKG	>SSSL	>ESV
METALS														
Aluminum	mg/kg	8.59E+03	1.15E+06	NA	6.66E+03					2.62E+03				
Arsenic	mg/kg	1.13E+01	5.58E+01	7.24E+00	3.18E+00					2.34E+00				
Barium	mg/kg	9.89E+01	8.36E+04	NA	1.25E+02		YES			8.01E+01				
Beryllium	mg/kg	9.70E-01	1.50E+02	NA	6.50E-01	J				6.13E-01	J			
Calcium	mg/kg	1.11E+03	NA	NA	4.99E+02					2.50E+02				
Chromium	mg/kg	3.12E+01	2.79E+03	5.23E+01	1.60E+01					4.73E+00				
Cobalt	mg/kg	1.10E+01	6.72E+04	5.00E+01	1.93E+01		YES			3.87E+00				
Copper	mg/kg	1.71E+01	4.74E+04	1.87E+01	2.95E+01		YES		YES	7.97E+00				
Iron	mg/kg	3.53E+04	3.59E+05	NA	1.50E+04					1.83E+04				
Lead	mg/kg	3.78E+01	4.00E+02	3.02E+01	3.04E+01				YES	1.94E+01				
Magnesium	mg/kg	9.06E+02	NA	NA	3.11E+02					1.99E+02				
Manganese	mg/kg	7.12E+02	4.38E+04	NA	9.02E+02		YES			3.16E+02				
Nickel	mg/kg	1.30E+01	1.76E+04	1.59E+01	9.51E+00					3.93E+00				
Potassium	mg/kg	1.01E+03	NA	NA	9.09E+02					1.12E+03		YES		
Selenium	mg/kg	7.20E-01	5.96E+03	NA	9.19E-01	J	YES			ND				
Sodium	mg/kg	6.92E+02	NA	NA	ND					2.37E+01	J			
Vanadium	mg/kg	4.09E+01	4.83E+03	NA	1.11E+01					6.58E+00				
Zinc	mg/kg	5.27E+01	3.44E+05	1.24E+02	3.42E+01					7.04E+00				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

VQ - Data validation qualifier.

- Antimony (5.41 to 50.3 mg/kg) exceeded its SSSL (3.11 mg/kg) and background (1.99 mg/kg) at four sample locations. All of the antimony results were flagged with a "J" data qualifier, indicating that the results were estimated.

- Copper (351 and 383 mg/kg) exceeded its SSSL (313 mg/kg) and background (12.7 mg/kg) at two sample locations.

- Lead (901 to 4,640 mg/kg) exceeded its SSSL (400 mg/kg) and background (40 mg/kg) at four sample locations.

- Manganese (1,870 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,579 mg/kg) at one sample location.

Figure 5-1 shows the surface and depositional soil sample locations with metals results exceeding SSSLs and background.

Thirteen metals were detected at concentrations exceeding ESVs: aluminum, antimony, arsenic, barium, chromium, copper, iron, lead, manganese, mercury, selenium, vanadium, and zinc. Of these, nine metals also exceeded their respective background concentrations:

- Aluminum (17,900 to 32,000 mg/kg) exceeded its ESV (50 mg/kg) and background (16,306 mg/kg) at seven sample locations.

- Antimony (5.41 to 50.3 mg/kg) exceeded its ESV (3.5 mg/kg) and background (1.99 mg/kg) at four sample locations.

- Barium (169 to 250 mg/kg) exceeded its ESV (165 mg/kg) and background (124 mg/kg) at three sample locations.

- Copper (65 to 383 mg/kg) exceeded its ESV (40 mg/kg) and background (12.7 mg/kg) at six sample locations.

- Lead (64.4 to 4,640 mg/kg) exceeded its ESV (50 mg/kg) and background (40 mg/kg) at eight sample locations.

- Manganese (1,870 mg/kg) exceeded its ESV (100 mg/kg) and background (1,579 mg/kg) at one sample location.

- Mercury (0.13 to 0.195 mg/kg) exceeded its ESV (0.1 mg/kg) and background (0.08 mg/kg) at three sample locations.

DWG. NO.: ...\796887es.735	
PROJ. NO.: 796887	
INITIATOR: T. WINTON	
PROJ. MGR.: J. YACOUB	
DRAFT. CHCK. BY:	
ENGR. CHCK. BY: S. MORAN	
DATE LAST REV.:	
STARTING DATE: 04/23/03	
DRAWN BY:	
DRAWN BY: D. BOMAR	
2/24/2004 3:36:54 PM	
lstout c:\cadd\Design\796887es.735	

E 693,200

E 696,200

N 1,176,400

N 1,174,100

Sample Identification		BKG	SSSL	HR-96Q-GP03
Sample Number				QP0006
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	2.13E+04

Sample Identification		BKG	SSSL	HR-148Q-MW01
Sample Number				QS0008
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	2.60E+04
Antimony	mg/kg	1.99E+00	3.11E+00	5.41E+00 J
Lead	mg/kg	4.01E+01	4.00E+02	1.01E+03 J

Sample Identification		BKG	SSSL	HR-96Q-GP01
Sample Number				QP0001
Sample Date				22-Jul-02
Lead	mg/kg	4.01E+01	4.00E+02	9.01E+02

Sample Identification		BKG	SSSL	HR-96Q-GP04
Sample Number				QP0008
Sample Date				22-Jul-02
Antimony	mg/kg	1.99E+00	3.11E+00	5.54E+00 J
Copper	mg/kg	1.27E+01	3.13E+02	3.83E+02

Sample Identification		BKG	SSSL	HR-145Q-GP02
Sample Number				QR0003
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	1.98E+04

FLOW

HR-96Q-MW01
HR-145Q-GP01
HR-145Q-SW/SD02
HR-96Q-GP03
HR-96Q-GP04
HR-96Q-GP01
HR-148Q-MW01
HR-148Q-GP01
HR-148Q-GP02
HR-148Q-GP03
HR-145Q-GP02
HR-145Q-GP03
HR-145Q-DEP01
HR-145Q-MW02
HR-96Q-GP02
HR-145Q-MW01

Sample Identification		BKG	SSSL	HR-148Q-GP01
Sample Number				QS0001
Sample Date				23-Jul-02
Antimony	mg/kg	1.99E+00	3.11E+00	5.03E+01 J
Copper	mg/kg	1.27E+01	3.13E+02	3.51E+02
Lead	mg/kg	4.01E+01	4.00E+02	4.64E+03 J

Sample Identification		BKG	SSSL	HR-148Q-GP02
Sample Number				QS0003
Sample Date				23-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	2.63E+04

Sample Identification		BKG	SSSL	HR-148Q-GP03
Sample Number				QS0005
Sample Date				23-Jul-02
Antimony	mg/kg	1.99E+00	3.11E+00	8.61E+00 J
Lead	mg/kg	4.01E+01	4.00E+02	1.62E+03 J

Sample Identification		BKG	SSSL	HR-145Q-DEP01
Sample Number				QR0012
Sample Date				03-Sep-02
Aluminum	mg/kg	1.63E+04	7.80E+03	3.20E+04

Sample Identification		BKG	SSSL	HR-145Q-MW02
Sample Number				QR0010
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	1.79E+04
Manganese	mg/kg	1.58E+03	3.63E+02	1.87E+03

Sample Identification		BKG	SSSL	HR-145Q-GP03
Sample Number				QR0005
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	7.80E+03	2.12E+04

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- FENCE
- TRENCH
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- MONITORING WELL / GROUNDWATER, SURFACE, AND SUBSURFACE SOIL SAMPLE LOCATION
- ▲ DEPOSITIONAL SOIL SAMPLE LOCATION
- J METAL WAS POSITIVELY IDENTIFIED; REPORTED VALUE IS AN ESTIMATED CONCENTRATION
- mg/kg MILLIGRAMS PER KILOGRAM
- SSSL SITE-SPECIFIC SCREENING LEVEL
- BKG BACKGROUND

SCALE

0 300 600 FEET

FIGURE 5-1
METALS RESULTS EXCEEDING SSSLs AND BACKGROUND IN SURFACE AND DEPOSITIONAL SOIL FORMER RANGE 42, PARCEL 96Q RANGE, CHOCCOLOCCO CORRIDOR PARCEL 145Q-X IMPACT AREA, CHOCCOLOCCO CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw™ Shaw Environmental, Inc.

- Selenium (0.97 to 2.53 mg/kg) exceeded its ESV (0.81 mg/kg) and background (0.48 mg/kg) at 13 sample locations. Four of the selenium results were flagged with a "B" data qualifier, indicating that selenium was also detected in an associated laboratory or field blank sample.

- Zinc (53.8 to 74.2 mg/kg) exceeded its ESV (50 mg/kg) and background (40.6 mg/kg) at three sample locations.

Figure 5-2 shows the surface and depositional soil sample locations with metals results exceeding ESVs and background.

Volatile Organic Compounds. Three surface and depositional soil sample locations (HR-96Q-GP04, HR-145Q-DEP01, and HR-148Q-MW01) were analyzed for VOCs. A total of two VOCs (2-butanone and acetone) were detected in the samples at estimated concentrations below their respective SSSLs and ESVs.

Semivolatile Organic Compounds. Three surface and depositional soil sample locations (HR-96Q-GP04, HR-145Q-DEP01, and HR-148Q-MW01) were analyzed for SVOCs. Three SVOCs (di-n-butyl phthalate, 2,4-dinitrotoluene, and n-nitrosodiphenylamine) were detected at one sample location (HR-96Q-GP04) at concentrations below their respective SSSLs and ESVs.

Pesticides. Three surface and depositional soil sample locations (HR-96Q-GP04, HR-145Q-DEP01, and HR-148Q-MW01) were analyzed for pesticides. A total of ten pesticides (4,4'-dichlorodiphenyltrichloroethane [DDT], heptachlor, alpha-hexachlorocyclohexane [BHC], beta-BHC, delta-BHC, gamma-BHC, endrin, methoxychlor, dieldrin, alpha-chlordane) were detected in the samples. All but two of the pesticide results were flagged with a "J" data qualifier, indicating that the compounds were detected at estimated concentrations below method reporting limits. The pesticide concentrations were below their respective SSSLs. The concentrations of seven pesticides exceeded ESVs:

- 4,4'-DDT (0.02 mg/kg) exceeded its ESV (0.0025 mg/kg) at HR-145Q-DEP01.

- Alpha-BHC (0.0087 mg/kg) exceeded its ESV (0.0025 mg/kg) at HR-145Q-DEP01.

- Beta-BHC (0.0055 mg/kg) exceeded its ESV (0.001 mg/kg) at HR-145Q-DEP01.

Sample Identification		BKG	ESV	HR-145Q-GP01
Sample Number				QR0001
Sample Date				22-Jul-02
Barium	mg/kg	1.24E+02	1.65E+02	2.50E+02
Lead	mg/kg	4.01E+01	5.00E+01	8.49E+01
Selenium	mg/kg	4.80E-01	8.10E-01	9.69E-01 J

Sample Identification		BKG	ESV	HR-96Q-GP01
Sample Number				QP0001
Sample Date				22-Jul-02
Copper	mg/kg	1.27E+01	4.00E+01	8.36E+01
Lead	mg/kg	4.01E+01	5.00E+01	9.01E+02
Selenium	mg/kg	4.80E-01	8.10E-01	1.01E+00 B

Sample Identification		BKG	ESV	HR-148Q-GP01
Sample Number				QS0001
Sample Date				23-Jul-02
Antimony	mg/kg	1.99E+00	3.50E+00	5.03E+01 J
Barium	mg/kg	1.24E+02	1.65E+02	1.69E+02
Copper	mg/kg	1.27E+01	4.00E+01	3.51E+02
Lead	mg/kg	4.01E+01	5.00E+01	4.64E+03 J
Selenium	mg/kg	4.80E-01	8.10E-01	1.35E+00
Zinc	mg/kg	4.06E+01	5.00E+01	7.42E+01

Sample Identification		BKG	ESV	HR-96Q-MW01
Sample Number				QP0010
Sample Date				22-Jul-02
Selenium	mg/kg	4.80E-01	8.10E-01	1.00E+00 B

Sample Identification		BKG	ESV	HR-96Q-GP04
Sample Number				QP0008
Sample Date				22-Jul-02
Antimony	mg/kg	1.99E+00	3.50E+00	5.54E+00 J
Copper	mg/kg	1.27E+01	4.00E+01	3.83E+02
Lead	mg/kg	4.01E+01	5.00E+01	6.44E+01
Zinc	mg/kg	4.06E+01	5.00E+01	5.64E+01 J

Sample Identification		BKG	ESV	HR-145Q-GP02
Sample Number				QR0003
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	1.98E+04
Selenium	mg/kg	4.80E-01	8.10E-01	2.53E+00

N 1,176,400

E 696,200

FLOW

HR-145Q-GP01
HR-145Q-SW/SD02
HR-96Q-GP01
HR-96Q-MW01
HR-96Q-GP03
HR-96Q-GP04
HR-148Q-GP01
HR-148Q-GP02
HR-148Q-MW01
HR-148Q-GP03
HR-145Q-GP02
HR-145Q-GP03
HR-145Q-DEP01
HR-145Q-MW02
HR-96Q-GP02
FIRING LINE
HR-145Q-MW01

Sample Identification		BKG	ESV	HR-96Q-GP03
Sample Number				QP0006
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	2.13E+04
Selenium	mg/kg	4.80E-01	8.10E-01	1.36E+00 B

Sample Identification		BKG	ESV	HR-148Q-GP02
Sample Number				QS0003
Sample Date				23-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	2.63E+04
Copper	mg/kg	1.27E+01	4.00E+01	6.50E+01
Lead	mg/kg	4.01E+01	5.00E+01	2.74E+02 J
Mercury	mg/kg	8.00E-02	1.00E-01	1.30E-01
Selenium	mg/kg	4.80E-01	8.10E-01	1.48E+00

Sample Identification		BKG	ESV	HR-96Q-GP02
Sample Number				QP0003
Sample Date				22-Jul-02
Selenium	mg/kg	4.80E-01	8.10E-01	1.36E+00 B

Sample Identification		BKG	ESV	HR-148Q-GP03
Sample Number				QS0005
Sample Date				23-Jul-02
Antimony	mg/kg	1.99E+00	3.50E+00	8.61E+00 J
Copper	mg/kg	1.27E+01	4.00E+01	2.20E+02
Lead	mg/kg	4.01E+01	5.00E+01	1.62E+03 J
Selenium	mg/kg	4.80E-01	8.10E-01	1.17E+00
Zinc	mg/kg	4.06E+01	5.00E+01	5.38E+01

Sample Identification		BKG	ESV	HR-145Q-DEP01
Sample Number				QR0012
Sample Date				03-Sep-02
Aluminum	mg/kg	1.63E+04	5.00E+01	3.20E+04
Barium	mg/kg	1.24E+02	1.65E+02	1.76E+02
Lead	mg/kg	4.01E+01	5.00E+01	1.57E+02
Mercury	mg/kg	8.00E-02	1.00E-01	1.95E-01
Selenium	mg/kg	4.80E-01	8.10E-01	2.09E+00

Sample Identification		BKG	ESV	HR-145Q-MW02
Sample Number				QR0010
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	1.79E+04
Manganese	mg/kg	1.58E+03	1.00E+02	1.87E+03
Selenium	mg/kg	4.80E-01	8.10E-01	1.07E+00 J

Sample Identification		BKG	ESV	HR-148Q-MW01
Sample Number				QS0008
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	2.60E+04
Antimony	mg/kg	1.99E+00	3.50E+00	5.41E+00 J
Copper	mg/kg	1.27E+01	4.00E+01	1.51E+02
Lead	mg/kg	4.01E+01	5.00E+01	1.01E+03 J
Mercury	mg/kg	8.00E-02	1.00E-01	1.56E-01
Selenium	mg/kg	4.80E-01	8.10E-01	1.45E+00

Sample Identification		BKG	ESV	HR-145Q-GP03
Sample Number				QR0005
Sample Date				22-Jul-02
Aluminum	mg/kg	1.63E+04	5.00E+01	2.12E+04
Selenium	mg/kg	4.80E-01	8.10E-01	1.20E+00

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- FENCE
- TRENCH
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- MONITORING WELL / GROUNDWATER, SURFACE, AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION

J	METAL WAS POSITIVELY IDENTIFIED; REPORTED VALUE IS AN ESTIMATED CONCENTRATION
B	ANALYTE DETECTED IN LABORATORY OR FIELD BLANK AT CONCENTRATION GREATER THAN THE REPORTING LIMIT (AND GREATER THAN ZERO)
mg/kg	MILLIGRAMS PER KILOGRAM
ESV	ECOLOGICAL SCREENING VALUE
BKG	BACKGROUND

FIGURE 5-2
METALS RESULTS EXCEEDING ESVs AND BACKGROUND IN SURFACE AND DEPOSITIONAL SOIL FORMER RANGE 42, PARCEL 96Q RANGE, CHOCCOLOCCO CORRIDOR PARCEL 145Q-X IMPACT AREA, CHOCCOLOCCO CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

SCALE
0 300 600 FEET

Shaw™ Shaw Environmental, Inc.

DWG. NO.: ...\796887es.736 | PROJ. NO.: 796887
INITIATOR: T. WINTON | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: S. MORAN
REV.: | DATE LAST REV.: | DRAWN BY:
2/24/2004 5:09:18 PM | STARTING DATE: 04/23/03 | DRAWN BY: D. BOMAR
lstout | c:\cadd\Design\796887es.736

- Gamma-BHC (0.001 mg/kg) exceeded its ESV (0.00005 mg/kg) at HR-145Q-DEP01.

- Endrin (0.0015 to 0.019 mg/kg) exceeded its ESV (0.001 mg/kg) at 2 sample locations (HR-96Q-GP04 and HR-145Q-DEP01).

- Methoxychlor (0.023 mg/kg) exceeded its ESV (0.02 mg/kg) at HR-148Q-MW01.

- Dieldrin (0.0034 mg/kg) exceeded its ESV (0.0005 mg/kg) at HR-96Q-GP04.

Herbicides. Three surface and depositional soil sample locations (HR-96Q-GP04, HR-145Q-DEP01, and HR-148Q-MW01) were analyzed for herbicides. Herbicides were not detected in the samples.

Explosives. One explosive compound (2,4-dinitrotoluene) was detected at one sample location (HR-96Q-GP04). The 2,4-dinitrotoluene result (1.5 mg/kg) exceeded its SSSL (0.93 mg/kg) and ESV (1.28 mg/kg).

5.2 Subsurface Soil Analytical Results

Fourteen subsurface soil samples were collected for chemical analysis at Parcels 96Q, 145Q-X, and 148Q-X. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

Metals. A total of 21 metals were detected in the subsurface soil samples. The concentrations of eight metals (aluminum, antimony, arsenic, chromium, iron, lead, manganese, and thallium) exceeded their respective SSSLs in one or more samples. Of these, aluminum, antimony, iron, and lead also exceeded their respective background concentrations:

- Aluminum (14,700 to 33,200 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (13,591 mg/kg) at 11 sample locations.

- Antimony (5.08 mg/kg) exceeded its SSSL (3.11 mg/kg) and background (1.31 mg/kg) at one sample location. The antimony result was "J" flagged, indicating that the result was estimated.

- Iron (60,800 mg/kg) exceeded its SSSL (2,345 mg/kg) and background (44,817 mg/kg) at one sample location.

- Lead (468 and 1,280 mg/kg) exceeded its SSSL (400 mg/kg) and background (38.5 mg/kg) at two sample locations.

Figure 5-3 shows the subsurface soil sample locations with metals results exceeding SSSLs and background.

Volatile Organic Compounds. Two subsurface soil sample locations (HR-96Q-GP04 and HR-148Q-MW01) were analyzed for VOCs. A total of two VOCs (acetone and 2-butanone) were detected in the samples at estimated concentrations below their respective SSSLs.

Semivolatile Organic Compounds. Two subsurface soil sample locations (HR-96Q-GP04 and HR-148Q-MW01) were analyzed for SVOCs. Two SVOCs (fluoranthene and n-nitrosodiphenylamine) were detected at one sample location (HR-96Q-GP04) at estimated concentrations below their respective SSSLs.

Pesticides. Two subsurface soil sample locations (HR-96Q-GP04 and HR-148Q-MW01) were analyzed for pesticides. Pesticides were not detected in either of the samples.

Herbicides. Two subsurface soil sample locations (HR-96Q-GP04 and HR-148Q-MW01) were analyzed for herbicides. Herbicides were not detected in either of the samples.

Explosives. Explosives were not detected in the subsurface soil samples.

5.3 Groundwater Analytical Results

Four groundwater samples were collected for chemical analysis at Parcels 96Q, 145Q-X, and 148Q-X at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

Metals. A total of ten metals were detected in the groundwater samples. The concentrations of two metals (manganese and iron) exceeded their respective SSSLs but were below background values except for manganese (1.69 milligrams per liter [mg/L]), which exceeded its SSSL (0.469 mg/L) and background (0.581 mg/L) at one location (HR-145Q-MW02).

DWG. NO.: ...\796887es.737 | PROJ. NO.: 796887
INITIATOR: T. WINTON | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: S. MORAN
STARTING DATE: 04/23/03 | DATE LAST REV.:
DRAWN BY: D. BOMAR | DRAWN BY:
2/24/2004 5:44:49 PM
lstout
c:\cadd\Design\796887es.737

E 693,200

E 696,200

N 1,176,400

N 1,174,100

PARCEL 96Q

PARCEL 148Q-X

PARCEL 145Q-X

FLOW

FLOW

FIRING LINE

HR-96Q-MW01

HR-145Q-GP01

HR-96Q-GP03

HR-96Q-GP04

HR-96Q-GP01

HR-148Q-MW01

HR-148Q-GP01

HR-148Q-GP02

HR-148Q-GP03

HR-145Q-GP02

HR-145Q-GP03

HR-145Q-MW02

HR-96Q-GP02

HR-145Q-MW01

Sample Identification		BKG	SSSL	HR-148Q-GP03
Sample Number				QS0006
Sample Date				23-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	1.49E+04
Lead	mg/kg	3.85E+01	4.00E+02	4.68E+02 J

Sample Identification		BKG	SSSL	HR-148Q-MW01
Sample Number				QS0009
Sample Date				22-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	1.81E+04

Sample Identification		BKG	SSSL	HR-96Q-MW01
Sample Number				QP0011
Sample Date				22-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	3.32E+04

Sample Identification		BKG	SSSL	HR-96Q-GP04
Sample Number				QP0009
Sample Date				22-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	1.90E+04

Sample Identification		BKG	SSSL	HR-96Q-GP03
Sample Number				QP0007
Sample Date				22-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	2.92E+04

Sample Identification		BKG	SSSL	HR-145Q-GP03
Sample Number				QR0006
Sample Date				22-Jul-02
Sample Depth (feet)				2 - 3
Aluminum	mg/kg	1.36E+04	7.80E+03	2.51E+04

Sample Identification		BKG	SSSL	HR-148Q-GP01
Sample Number				QS0002
Sample Date				23-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	1.47E+04
Antimony	mg/kg	1.31E+00	3.11E+00	5.08E+00 J
Lead	mg/kg	3.85E+01	4.00E+02	1.28E+03 J

Sample Identification		BKG	SSSL	HR-148Q-GP02
Sample Number				QS0004
Sample Date				23-Jul-02
Sample Depth (feet)				2 - 3
Aluminum	mg/kg	1.36E+04	7.80E+03	2.40E+04

Sample Identification		BKG	SSSL	HR-145Q-MW01
Sample Number				QR0008
Sample Date				23-Jul-02
Sample Depth (feet)				2 - 3
Aluminum	mg/kg	1.36E+04	7.80E+03	1.70E+04

Sample Identification		BKG	SSSL	HR-145Q-GP02
Sample Number				QR0004
Sample Date				22-Jul-02
Sample Depth (feet)				1 - 2
Aluminum	mg/kg	1.36E+04	7.80E+03	2.49E+04
Iron	mg/kg	4.48E+04	2.34E+03	6.08E+04

Sample Identification		BKG	SSSL	HR-145Q-MW02
Sample Number				QR0011
Sample Date				22-Jul-02
Sample Depth (feet)				3 - 4
Aluminum	mg/kg	1.36E+04	7.80E+03	1.69E+04

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- FENCE
- TRENCH
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- MONITORING WELL / GROUNDWATER, SURFACE, AND SUBSURFACE SOIL SAMPLE LOCATION
- J — METAL WAS POSITIVELY IDENTIFIED; REPORTED VALUE IS AN ESTIMATED CONCENTRATION
- mg/kg — MILLIGRAMS PER KILOGRAM
- SSSL — SITE-SPECIFIC SCREENING LEVEL
- BKG — BACKGROUND

SCALE

0 300 600 FEET

FIGURE 5-3
METALS RESULTS EXCEEDING SSSLs AND BACKGROUND IN SUBSURFACE SOIL
FORMER RANGE 42, PARCEL 96Q
RANGE, CHOCCOLOCCO CORRIDOR
PARCEL 145Q-X
IMPACT AREA, CHOCCOLOCCO CORRIDOR, PARCEL 148Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

Volatile Organic Compounds. One groundwater sample location (HR-148Q-MW01) was analyzed for VOCs. Methylene chloride was detected in the sample at a concentration below its SSSL.

Semivolatile Organic Compounds. One groundwater sample location (HR-148Q-MW01) was analyzed for SVOCs. SVOCs were not detected in the sample.

Pesticides. One groundwater sample location (HR-148Q-MW01) was analyzed for pesticides. Pesticides were not detected in the sample.

Herbicides. One groundwater sample location (HR-148Q-MW01) was analyzed for herbicides. Herbicides were not detected in the sample.

Explosives. Two explosive compounds (1,3,5-trinitrobenzene and 2,4,6-trinitrotoluene) were detected in one groundwater sample each at estimated concentrations below their respective SSSLs.

5.4 Surface Water Analytical Results

Two surface water samples were collected for chemical analysis at the locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-4. It should be noted that the assumptions for residential and recreational site user exposure to surface water are identical. The surface water samples were analyzed for metals and explosives only.

Metals. A total of 11 metals were detected in the surface water samples at concentrations below their respective SSSLs. The concentrations of four metals (aluminum, barium, cobalt, and lead) exceeded their respective ESVs but were below background concentrations (note: a background value for cobalt was not available).

Explosives. Explosives were not detected in the surface water samples.

5.5 Sediment Analytical Results

Two sediment samples were collected for chemical and physical analyses at the locations shown on Figure 3-1. Analytical results were compared to recreational site user SSSLs, ESVs, and metals background concentrations, as presented in Table 5-5. It should be noted that the

assumptions for residential and recreational site user exposure to sediment are identical. The sediment samples were analyzed for metals, explosives, TOC, and grain size.

Metals. A total of 18 metals were detected in the sediment samples at concentrations below SSSLs. Lead and copper concentrations exceeded their respective ESVs at sample location HR-131Q-SW/SD01. The lead result was below background; however, the copper result (29.5 mg/kg) exceeded background (17.1 mg/kg) and the ESV (18.7 mg/kg). ESVs were not available for barium, manganese, and selenium, all of which exceeded their respective background concentrations at sample location HR-131Q-SW/SD01.

Explosives. Explosives were not detected in the sediment samples.

Total Organic Carbon. TOC concentrations in the sediment samples were 3,530 mg/kg and 37,300 mg/kg, as summarized in Appendix F.

Grain Size. The results of grain size analysis for the sediment samples are included in Appendix F.

6.0 Summary, Conclusions, and Recommendations

Shaw completed an SI at Former Range 42, Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical mission-related Army activities. The SI consisted of the collection and analysis of 15 surface and depositional soil samples, 14 subsurface soil samples, 4 groundwater samples, 2 surface water samples, and 2 sediment samples. In addition, 4 permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the site indicates that metals, VOCs, SVOCs, pesticides, and explosive compounds were detected in site media. Analytical results were compared to SSSLs, ESVs, and background screening values developed for human health and ecological risk evaluations as part of investigations being performed under the BRAC Environmental Restoration Program at FTMC.

Constituents detected at concentrations exceeding SSSLs and background (where available) were identified as COPCs in site media. COPCs included five metals (aluminum, antimony, copper, lead, and manganese) and one explosive compound (2,4-dinitrotoluene) in surface soil; four metals (aluminum, antimony, iron, and lead) in subsurface soil; and manganese in groundwater. The most significant COPC was lead, which was detected at concentrations (468 to 4,640 mg/kg) exceeding its residential SSSL (400 mg/kg) in four surface soil samples and two subsurface soil samples. VOC, SVOC, and pesticide concentrations in site media were all below SSSLs.

Constituents detected at concentrations exceeding ESVs and background (where available) were selected as constituents of potential ecological concern (COPEC) in surface soil, surface water, and sediment. The COPECs identified in surface soil were nine metals (aluminum, antimony, barium, copper, lead, manganese, mercury, selenium, and zinc), seven pesticides (4,4'-DDT, alpha-BHC, beta-BHC, gamma-BHC, dieldrin, endrin, and methoxychlor), and one explosive compound (2,4-dinitrotoluene). Cobalt was the only COPEC identified in surface water. Sediment COPECs were barium, copper, manganese, and selenium.

Based on the results of the SI, past operations at Parcels 96Q, 145Q-X, and 148Q-X have impacted the environment. Therefore, Shaw recommends that a remedial investigation be conducted to determine the extent of contamination in soil and groundwater at Former Range 42,

Parcel 96Q; Range, Choccolocco Corridor, Parcel 145Q-X; and Impact Area, Choccolocco Corridor, Parcel 148Q-X.

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
ABLM	adult blood lead model
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEDA	ammunition, explosives, and other dangerous articles
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALARNG	Alabama Army National Guard
ALAD	δ-aminolevulinic acid dehydratase
ALDOT	Alabama Department of Transportation
amb.	amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
AP	armor piercing
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
AS/SVE	air sparging/soil vapor extraction
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWQC	ambient water quality criteria
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
BGR	Bains Gap Road
bgs	below ground surface
BHC	hexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
$CaCO_3$	calcium carbonate
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CACM	Chemical Agent Contaminated Media
CAMU	corrective action management unit
CBR	chemical, biological, and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	phosgene (carbonyl chloride)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIH	Certified Industrial Hygienist
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; chemical of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical of potential concern
COPEC	constituent of potential ecological concern
CPOM	coarse particulate organic matter
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent; Clean Water Act
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAAMS	depot area agent monitoring station
DAF	dilution-attenuation factor

List of Abbreviations and Acronyms *(Continued)*

DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical Biological Center
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
EPT	Ephemeroptera, Plecoptera, Trichoptera
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FBI	Family Biotic Index
FD	field duplicate
FDC	Former Decontamination Complex
FDA	U.S. Food and Drug Administration
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
f_{oc}	fraction organic carbon
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	Federal Register
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin (isopropyl methylphosphonofluoridate)
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
H&S	health and safety
HA	hand auger
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
HCl	hydrochloric acid
HD	distilled mustard (bis-[dichloroethyl]sulfide)
HDPE	high-density polyethylene
HE	high explosive
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
H_2O_2	hydrogen peroxide
HPLC	high-performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour

HRC	hydrogen releasing compound
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IASPOW	Impact Area South of POW Training Facility
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_d	soil-water distribution coefficient
kg	kilogram
KeV	kilo electron volt
K_{oc}	organic carbon partioning coefficient
K_{ow}	octonal-water partition coefficient
$KMnO_4$	potassium permanganate
L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)
L/kg/day	liters per kilogram per day
l	liter
LAW	light anti-tank weapon
lb	pound
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LOEC	lowest-observable-effect-concentration
LRA	land redevelopment authority
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MeV	mega electron volt
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MNA	monitored natural attenuation
MnO_4-	permanganate ion
MOA	Memorandum of Agreement
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPC	maximum permissible concentration
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&MP	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
$NaMnO_4$	sodium permanganate
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO_3-	nitrate
NOEC	no-observable-effect-concentration
NPDES	National Pollutant Discharge Elimination System

NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
NRT	near real time
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O_3	ozone
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritoltetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
R	rejected data; resample; retardation factor
R&A	relevant and appropriate
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RBRG	risk-based remedial goal
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RD	remedial design
RDX	cyclotrimethylenetrinitramine
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RR	range residue
RRF	relative response factor
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RWIMR	Ranges West of Iron Mountain Road
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate

SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TEA	triethylaluminum
Tetryl	trinitrophenylmethylnitramine
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
URF	unit risk factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards